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WRITTEN SO YOU CAN UNDERSTAND IT

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Popular Mechanics Magazine
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Vol. 40 DECEMBER, 1923 No. 6

"Pepping" Used Cars for Quick Sale to Unwary Buyers

THERE are more tricks in selling a used automobile than David Harum ever dreamed of when he was trading horses," remarked the owner of a garage sadly to a man who had recently passed through his shop.

On the way the visitor had run across a friend lying beneath a battered specimen of a car. Beside him was a package of a widely known breakfast food and a smear of grease from the transmission case cover.

"Getting ready to feed?" he had asked.

"Nope," was the answer. "Just trying to 'dope' up this old wreck until I can get rid of it."

"But what are you going to do with the 'oats'?"

"I'm putting them in to stop the noise of these gears until I can sell the 'bus'."

Then he went on to explain that chattering, whining, or generally noisy gears in the motor, transmission, or differential were one of the first signs of approaching senility in an automobile.

In comparatively new cars, the remedy, of course, lies in refitting, but in the older models that are sold "azz-izz," this would be too expensive, and so owners and unscrupulous dealers resort to wood fiber mixed with grease, ground cork similar to that in which grapes are packed, or even the heavy brands of breakfast food. The result is a few days of quiet operation until the foreign substance is packed outside the reach of the gear teeth, and then—more noise than ever.

Before manufacturing processes became as perfected as they are today, even the makers resorted to such subterfuges. Many years ago, a plant whose cars have long since disappeared from the highways had considerable trouble with noisy differentials. The fault was serious enough to stop sales, but the manufacturer had neither the time nor the money to make replacements after the cars had come through production. And yet, some way

had to be found to meet the emergency.

Finally the head tester ordered a large pot of tar to be placed behind the factory. No one knew about it except members of the test crews, and they said nothing, but when they found a car with a noisy axle, they drove it behind the plant, poured a ladle of hot tar into the offending differential, and all noise miraculously vanished. Of course, the trouble came back, but probably not until the car had been safely sold and paid for.

This incident took place in the days when the motor car had hardly emerged from the experimental stage. Today, not even the smallest plant would countenance such a deception, and no reputable dealer or distributor would permit the "doping" of even a used car. Where tricks are practiced, they are the work of fly-by-night individuals who are seeking to make a quick profit on some old car they have picked up for a song.

In such cases, there are scores of ways of quickly rejuvenating a worn-out machine. Lampblack and turpentine will make old upholstery look like new for a few hours. Preparations that lend a deceptive luster to the body finish and top, although they result in their eventual destruction, are readily obtained.

Rubber paint helps the oldest tires to deceive even the expert eye, while cheap interliners hold it together for a few more miles. Piston slapping may be cured for a time by replacing the regular lubricant with steam cylinder oil (known as 600 W), which is about the consistency of molasses. And even the storage battery, when it is actually too weak to turn over the starter, can be brought back to a short life by adding strong acid to the electrolyte.

Then in demonstrating, seemingly marvelous changes may be wrought in the performance of a motor by the addition of a very small quantity of ether to the gasoline. Sometimes, also, moth balls are used for the same purpose, although there is considerable debate as to their efficiency.

But, after all, the main dependence of the salesman is upon the ignorance of his prospect and his own quick thinking. This is illustrated by the story of a prospect who demanded that the demonstrator drive up a hill that the latter knew the car would not make.

"Blank car will make it easily," the would-be purchaser announced.

"That's nothing," said the driver, "this car will even back up that hill," and to prove it, he

Acid, Ground Cork, Moth Balls and Ether Being Used to Rejuvenate an "Azz-Izz"

The Junk Heap, Where Automobiles Find Their Last Resting Place, Some of the Parts Being Salvaged and the Upholstery Burned, the Bodies Going to the Steel Furnace

turned the car around and mounted the grade in reverse.

As a result, the sale was instantly closed, the prospect not being sufficiently familiar with mechanics to know that the average reverse-gear ratio is so low that any car will almost back up the side of a wall.

Good or bad, however, there comes a time when every car is fit only for the junk heap. Usually, the body wears out first. Then the rivets in the frame loosen up and the transmission and differential gears become worn beyond hope of redemption.

Contrary to the general impression, the motor generally lives longer than the car and when its usefulness on the road is over, it often finds a place on the farm or in a motor boat. Also, many of the smaller parts are salvaged and resold by the junk dealer who dismembers the machine.

About the only material that is not put to some use is the upholstery and top fabric. To dispose of these in the quickest way, the bodies are ripped from the chassis, piled in an open-air furnace, and burned. The metal parts that remain are then sold and remelted by the steel mills. Copper, brass, and aluminum scrap also find a ready market and are made into various things.

After steadily rising from a product with an uncertain future some 25 years ago, the motor car commanded third place in the rank of the nation's industrial products two years ago. In 1921, it was topped only by packing and petroleum products.

Today, according to the latest government census of manufacturers, the motor car leads them all. The number of vehicles produced in the United States this year will be between three and one-half and four million, according to official estimates.

Taking the National Automobile Chamber of Commerce's figures that the average value of a passenger car is $750 and that of a truck $1,500, the estimates conclude that the year's output will exceed three billion dollars in value.

On July 1 there were over 13 million passenger and truck motor vehicles in operation in this country—one to every nine inhabitants. That showed an increase in four years of 85 per cent in cars used.

As it is estimated that the life of a car is about five years, greater numbers of used cars are coming on the market each year.

¶To warn miners of the presence of fire damp, a lamp has been invented in England that sounds a clear musical note when the atmosphere contains two per cent of this harmful gas. As the quantity of this vapor increases, the pitch and intensity of the instrument's tone rise in proportion, sounding an unmistakable alarm.

LINE GUIDE ON TYPEWRITERS IS RUN BY MOTOR

Preventing eyestrain by placing notes to be copied directly in front of the typist, an electric motor-driven line guide for a

The Line Guide and Copyholder that Is Operated by Electricity to Increase Typist's Speed

copyholder has increased the efficiency of stenographers. The invention was recently put on the market by an eastern man. Two buttons placed before the typewriter keyboard within easy reach of the thumbs are connected by wires with the motor. A slight touch on one raises the line guide, and pressure on the other lowers it.

ROUND-THE-WORLD TRIP BY AIR TO START NEXT SPRING

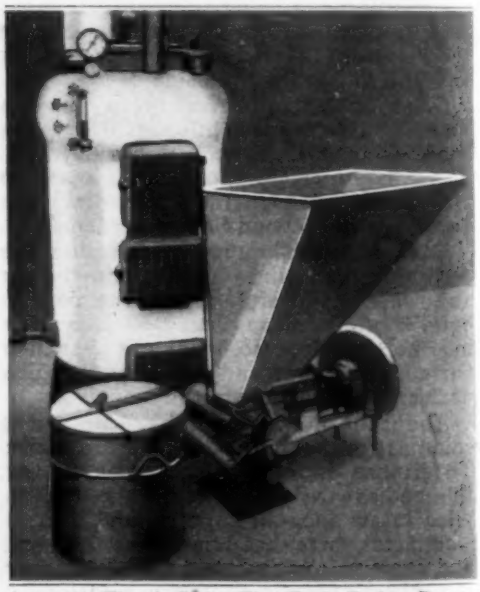
Preparations are now being made by the British air force for a trip around the world next spring. The route will be by the way of France, Egypt, Mesopotamia, Persia, India, Burma, China, Japan, Kamchatka, the Aleutian Islands, Canada, New York, St. Johns, and a final lap across the Atlantic to England. If the weather conditions are favorable when the ship reaches the United States, the Atlantic Ocean will be crossed in a single hop, otherwise the plans are to go by the way of the Azores and Portugal. It is estimated that the total distance to be covered will be about 21,000 miles, which, at an average of 100 miles an hour, would occupy 10 days' flying time.

MAZE OF WALLS SLOW AUTOS AT RAILROAD CROSSING

To reduce the possibilities of railroad-crossing accidents, a system of walls has been devised, which are so arranged that a motorist is forced to slow down to five miles an hour before passing over the tracks. While of sufficient height to prevent a machine from bouncing over them, the concrete abutments are low enough to give the driver a clear view ahead. As each car enters the passageway, it is compelled to fall in line. Thus the automobilist who may desire to go around those in front is checked by the barriers. In the center of the road there is a fencing, which provides a straight driveway after the machines have crossed the railroad.

FIRE FED BY ELECTRIC STOKER THAT PUTS ASHES IN CAN

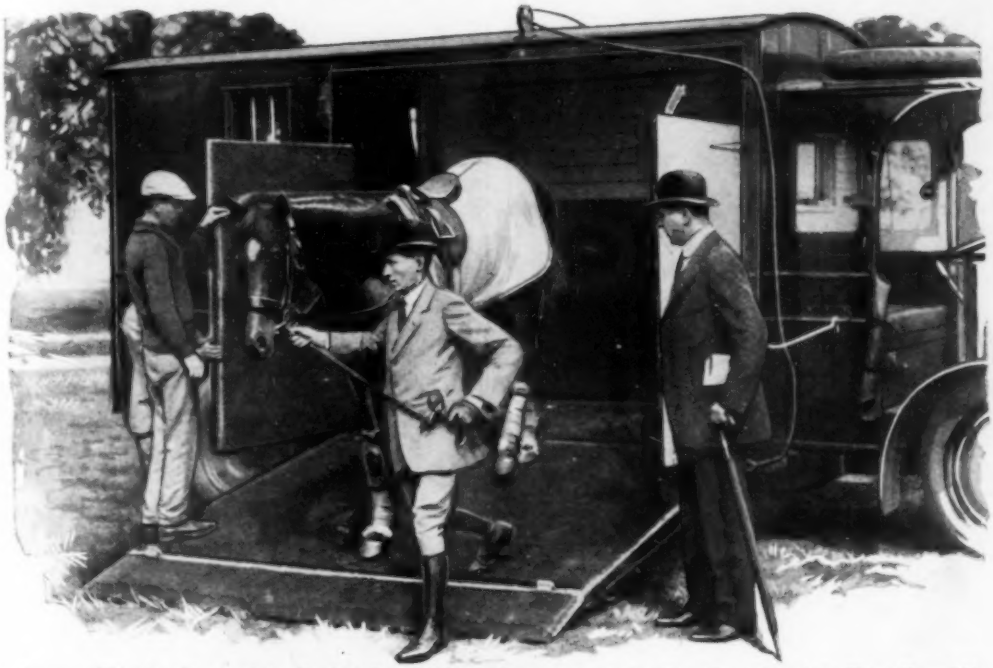
Furnaces equipped with an electric stoker, being made in an eastern city, can receive an even and constant supply of fuel and have the ashes removed and stored in a can without any other aid. By making use of the cheaper grades and sizes of coal, which are burned at a regular temperature, the apparatus saves considerable on the cost of heat. It is built to



Automatic Electric Stoker That Feeds Fuel to Furnace and Stores Cinders in Ash Can

attach to any steam, hot-water, or hot-air furnace and operates by a motor that gets power from an ordinary light socket.

RACE HORSE RIDES LIKE ROYALTY IN SPECIAL AUTO



Papyrus, Winning Horse of the English Derby, Which Crossed Ocean to Meet Best American Three-Year-Old, Being Led Out of Padded Automobile that Carried It from Ship to Race Track

Papyrus, winning horse of the English Derby, which was brought to the United States recently to participate in a match race with America's best three-year-old, was conveyed from the ship to quarters at the race track in a padded automobile. This was but one of the many precautions taken to prevent injury to the fleet animal. On the voyage it was closely attended by a veterinary who regulated its diet and watched over its health, and several trainers guarded the prized beast constantly night and day. Not once during the entire trip was the horse left alone.

ADS PRINTED ON SEALING TAPE AS IT IS UNWOUND

To reduce printing costs and save time, a holder for wrapping tape used instead of string is being made that prints a continuous series of advertisements on one side of the paper, wets the gum on the opposite surface, and cuts it into required lengths. There are no wearing parts to get out of order, and the inked rolls are instantly removable and interchangeable, permitting a merchant to substitute new designs and color combinations. Thus, attention can be called to special sales or products. The ink is dried as the strip is pulled from the container. Sealing tape, besides making a neat package, and handled as easily as twine, is said to be much cheaper.

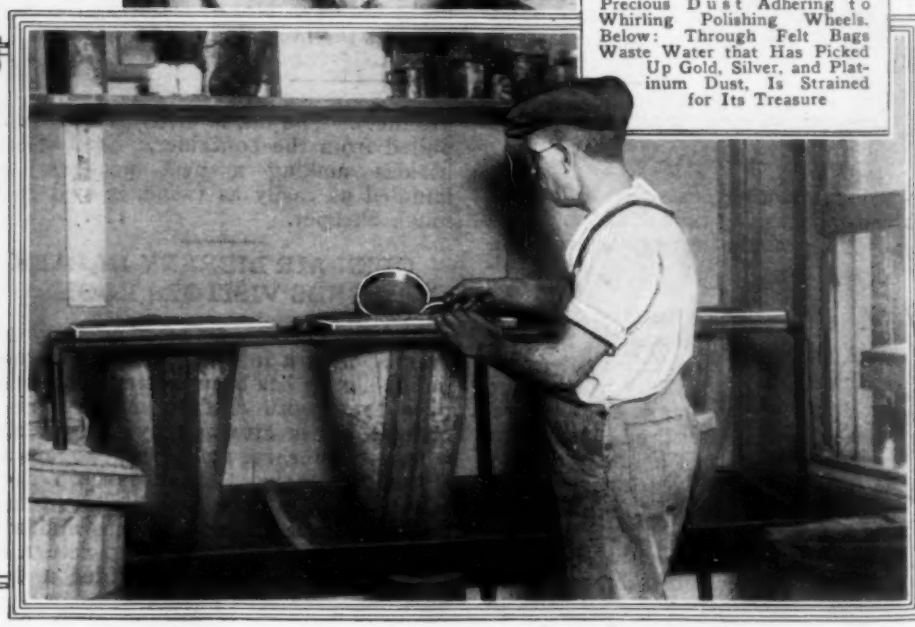
OPEN-AIR LIBRARY IN PARK LENDS VISITORS BOOKS

For the convenience of frequenters of a municipal park in Spain, a small open-air public library has been erected, which supplies them with reading matter free of charge. It is attended by a policeman, who, each morning and evening, opens and closes the shelves. Visitors help themselves to any volumes they desire, sit down on the benches under palm trees, and, after having enjoyed their reading, return the books. No receipt is demanded and no book has ever been stolen.

Magnets Have Proved Efficient for Removing Iron and Steel Filings that Become Mixed with the Fine Particles of Valuable Metals Gathered About Jewelry Plants

Floors of Factories Working in Valuable Metals Are Cleaned Daily by Powerful Vacuum Devices that Convey the Sweepings to Storage Tanks for Safe Keeping

Suction Tubes Leading to a Central Reservoir Collect the Precious Dust Adhering to Whirling Polishing Wheels. Below: Through Felt Bags Waste Water that Has Picked Up Gold, Silver, and Platinum Dust, Is Strained for Its Treasure



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Mining Gold from Dust on Floors

How a Youth's Idea Led to Recovery of Long-Spurned Wealth

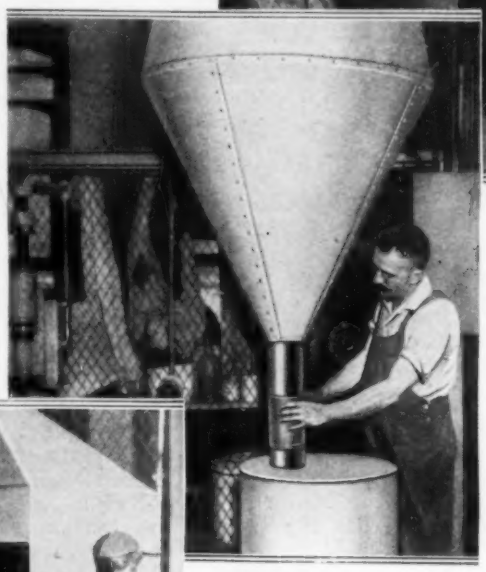
OLD King Midas was immortalized in fable through a gift of the gods by virtue of which everything he touched, including his little daughter, turned to gold.

Just a humble youth employed in a modest jewelry manufacturing establishment had an idea and rented the yard at the rear of the shop where for years sweepings of the plant had been thoughtlessly thrown on the ground. He dug up the earth by wagon loads, treated it, and amassed a fortune in the platinum, gold, and silver with which it was richly laden.

Then the young man leased a vacant building that had been occupied by jewelers for many years. He tore up the floor and found its timbers a veritable mine of precious dust. Another deposit of the treasure had settled in the soil beneath, and his second fortune was reaped.

Soon after, jewelers began to install elaborate machinery to reclaim the fortunes in valuable metals which, before that time, had been recklessly trodden under foot. Suction plays an important role in this phase of the recovery. Behind each buffing and lapping wheel, a tube is fixed, opening in a trumpetlike enlargement. Dust is drawn into these and, thence, conveyed to a great metal drum. Jewelry from the polishing wheels is washed in a solution of hot water and ammonia which is carried off, passing through sinks into settling tanks, where gravity robs it of the precious freight it has picked up, much after the fashion of the old-time placer mine.

Melting Precious Dust from Sweepings



Tank Where Vacuum Cleaners Store Dirt

Photos Copyright, Underwood & Underwood

Chemicals Are Often Used to Extract Gold from Dirt

The ablutions of the workmen provide another source of revenue. The metallic grime which they clean from their hands at the washbowls passes into basins beneath and is later recovered. Even the aprons they wear at their toil yield a precious toll, the water from the tub in which

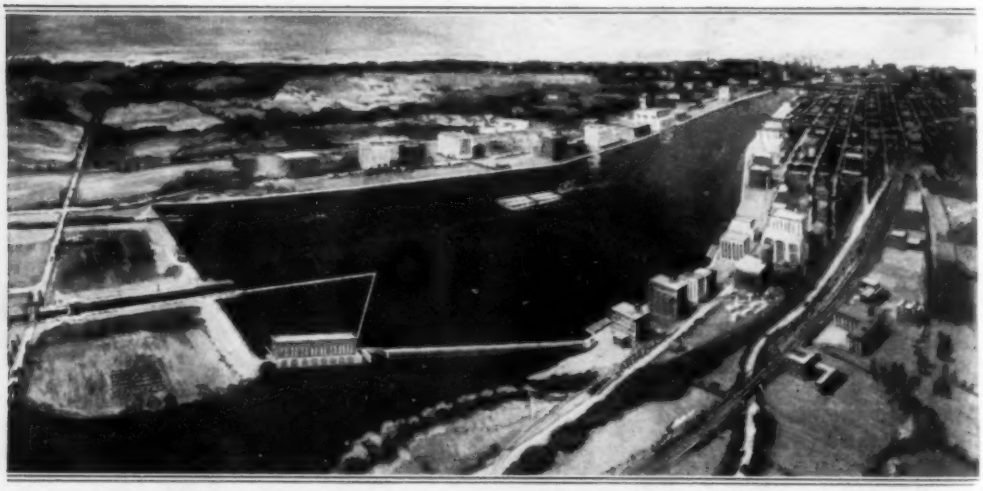
they are laundered being saved for treatment. All this miry waste is collected at weekly intervals and strained through bags of felt.

While these processes are going on, the hand of economy is turned in another direction. The floors are cleaned by vacuum and all the dust is scrupulously stored in containers. But conservation does not yet reach its pinnacle. It is carried to its highest point in the employment of metal doormats at the entrances to the workrooms to catch the particles of dust adhering to the shoes of the operators.

Metals recovered thus, from every nook and cranny, are now ready for the next step. The gleanings from felt bag, floor, and polishing wheel are placed in a gas stove and heated to incandescence. The resulting mass is thrown into a cylindrical sieve which separates lumps from the pulverized dust. These lumps are crushed in a mortar and directly refined.

Roughly, a pound of the reclaimed dust is worth between $24 and $25, and its combined value mounts up swiftly through the weeks and months of daily operation. The yearly saving in one large jewelry-manufacturing plant reaches a total of several thousand dollars.

LAKES-TO-GULF WATERWAY NEARS REALITY



First of Illinois Waterway Locks Completed, Visualizing Dream of Early Explorers—an Unbroken Water Route from Great Lakes to Gulf of Mexico

With the recent completion of the huge locks at Marseilles, Ill., the first link in that state's $20,000,000 waterway project has been forged and the dream of a century—a water route from the Great Lakes to the Gulf of Mexico—approaches reality. Four other similar structures, 600 feet long and 110 feet wide, are yet to be erected in the Desplaines and Illinois rivers between Lockport and Utica, a distance of 60 miles. Each will have a lockage of 9,000 tons, equal to 13 average freight-train loads, and together will develop a total of 75,000 electrical horsepower, estimated to create between $1,000,000 and $1,500,000 in revenue for the state. When these systems, including necessary dams and power plants, are in operation, accommodations will have been provided for 60,000,000 tons of freight traffic annually, and the neighboring territory will have a direct water route to all parts of the world. As a result, engineers, affirm, exporting and importing costs will be lowered, while the saving on the carrying of coal alone to central and northern Illinois will approximate $15,000,000 yearly.

AUTOMATIC GEAR TO REPLACE CLUTCH IN AUTOS

In the invention in England of an automatic automobile gear, which dispenses with the clutch, gear box, and the usual type of rear-drive axle, certain engineers see the beginning of a new era in the industry that will be marked by many revolutionary changes in the vehicle's mechanism. The device is said to instantly adjust itself to loads and grades without attention from the driver.

RIFLE AS SAW, SMOKESTACK IS SNUFFER, FOR WELL FIRE

Shooting flames 75 feet into the air, a "wild" gas well, which threatened a Canadian field recently, was controlled and recapped by cutting its casing with a stream of steel-jacketed bullets from a high-powered rifle and then diverting the fire through an old smokestack, while workers plugged the pipes. For some reason, the ordinary capping failed and the resulting flow of gas became ignited, producing a blaze of peculiar shape. One end beat the ground, preventing a close approach, while the other hurtled into the air. The heat was so great that the pipe and its fittings became white-hot. The rifle was set up on a tripod some distance away and aimed at the casing. As a bullet penetrated the metal, a jet of burning gas spurted directly back at the gun. As the firing continued, the casing rim was completely separated and the flame rose like a torch. The smokestack was rigged up on a trolley strung between a derrick and a tree. By means of pulleys and guide wires its lower end was hauled over the blaze. Draft caused the gas to flow into it and burn at the top. When the casing cooled, the stack was swung into another position, cutting off the supply of gas at its head and putting out the flame at the peak of the improvised "snuffer."

WOOD PINS FOR GOLF TEES KEEP HANDS CLEAN

As a substitute for sand, spiked pieces of wood with cupped tops are being used as golf tees. They insure clean hands and clothes and a grip free from grit. There is no time wasted in preparing the small elevations, for these accessories can be stuck into the ground easily to a depth that will meet the requirements of the player. Their smooth surfaces offer little resistance to the white pellets. A dozen or more of them can be carried conveniently in any pocket. Painted red, they are not easily lost and can be used repeatedly.

CHILDREN AT PLAY "HOBBLED" FOR SAFETY

Safety-first methods of an English mother, unable to neglect housework to watch over her small children, consist of

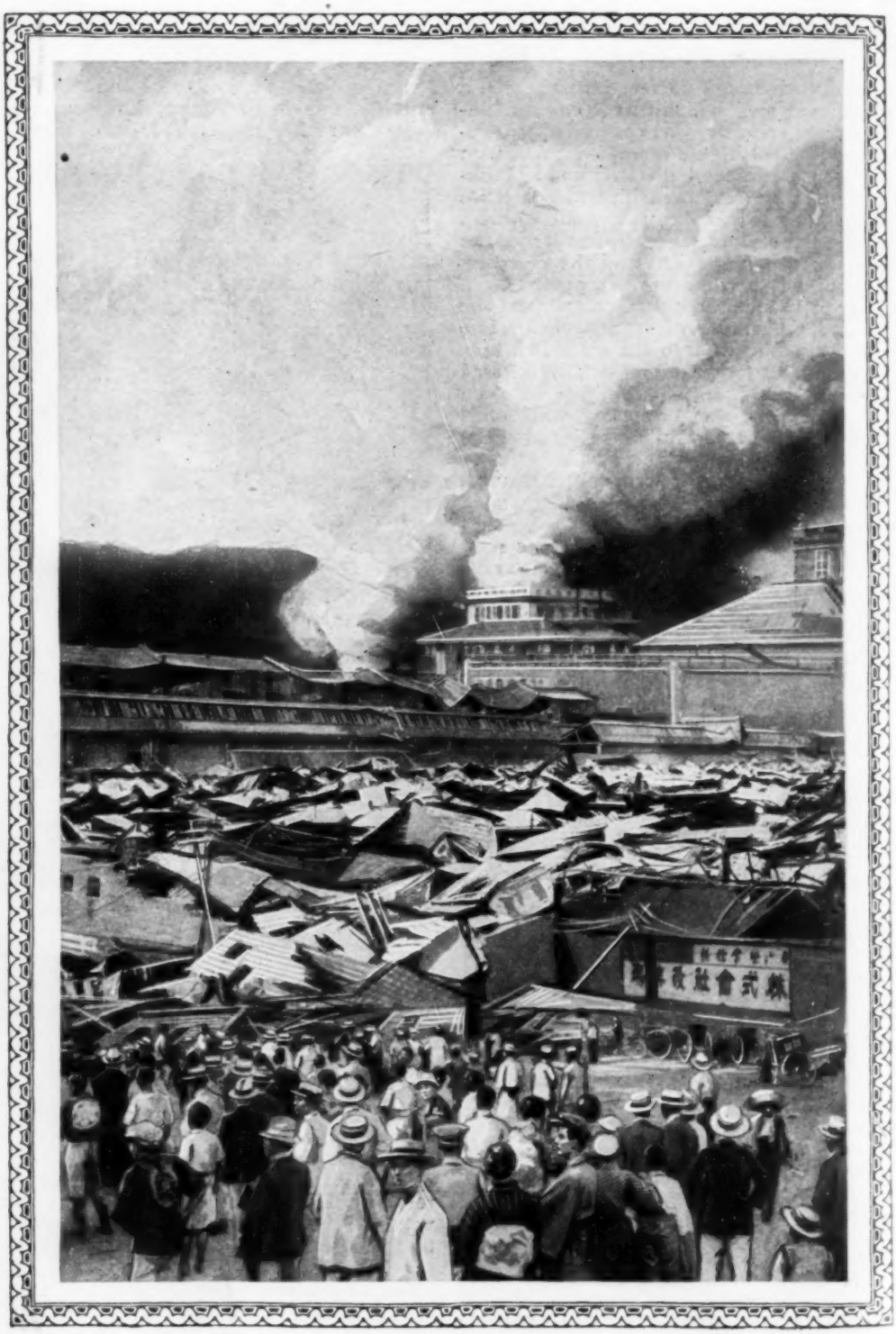
Children Tied to Post Like Maypole Dancers to Keep Them Out of Harm's Way

tying them to a post in the yard by means of long tapes. While it gives them plenty of freedom, they are restrained from straying into a near-by highway frequented by automobiles. Like revelers in a maypole dance, the youngsters frolic at the end of their tethers while their parent performs her tasks without interruption or worry over their welfare.

WEEDS "TURNED INTO MUTTON" BY CHANCE DISCOVERY

Australian saltbush, that covers many million acres in northwestern United States, is being "turned into mutton" as the result of the chance discovery of a Washington ranch owner. He kept a flock on a pasture of this weed for an entire summer and found that they produced more and better wool and mutton than other animals in the neighborhood. Hitherto considered a nuisance, saltbush grows on arid and unfertilized land, where nothing else will thrive, and requires almost no attention after it is once well started. The value of the vegetation was first brought to the attention of the rancher when he saw some sheep feeding upon it greedily, while he was resting by the roadside.

¶Trading in dog skins is an important business in Mongolia and Manchuria.



Following the Earthquakes, the Horrors of Fire Confronted the Terrified Residents of Tokio When They Turned Back to See Their Homes a Ragged Mass of Wreckage

Trail of Future Earthquakes Traced

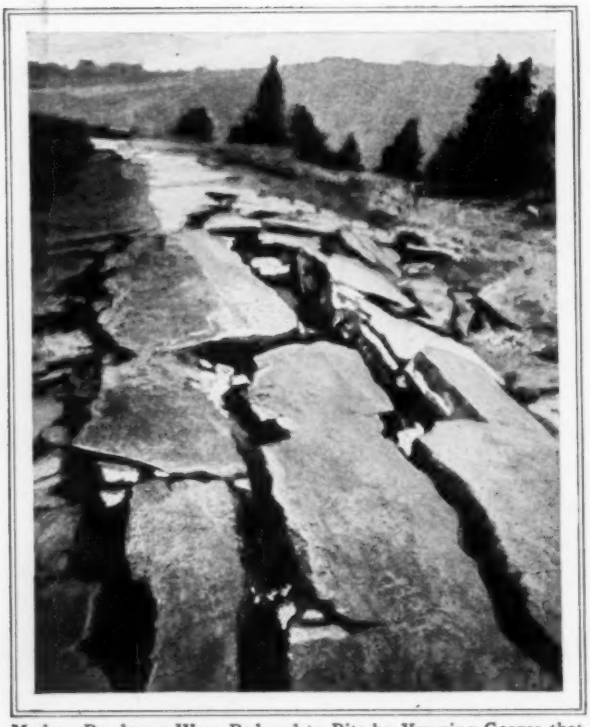
Science Seeks to Map Path Tremors Will Take in Years to Come; American Cities Safe Because of Land Forms

FUTURE paths of earthquakes are being traced by scientists now studying the details of the upheaval that brought tragedy and ruin to a large section of Japan. This disaster, authorities say, culminated a series of volcanic eruptions and earth tremors that were in progress for the year previous in regions in and about the Pacific Ocean.

America, however, is safe, according to the observers, who call attention to the great depth of the mountainous land formations with an absence of faults and ledges which are blamed for the slipping of earth strata. Investigations of quake zones seem to indicate that most of the disasters are confined to island and coast regions. Seldom do they extend to any great distances inland. It has also been pointed out that the zones of seismic disturbances largely center in the neighborhood of the equator, those nearest it being more active than the distant ones.

Sheltered Against Weather and Falling Embers from the Flames, These Refugees Occupied a Damaged Water Main

In their 12 months of performances the subterranean forces traveled over half the globe,



Modern Roadways Were Reduced to Bits by Yawning Gorges that Opened When the Ground Rose Up

moving like some gigantic burrowing monster. In their wake they left havoc spread by tidal waves and earthquakes, often breaking out in fierce blasts of volcanoes that disgorged rivers of white-hot lava and clouds of burning cinders. Chile felt this power in November of 1922, when three cities of that country were damaged and many lives lost. Hardly had the stricken area recovered from the blow when another shock struck it with equal loss.

From that time until the recent Japanese disaster it was a dull day for earthquakes when the recording instruments of the scientific observatories failed to register some evidence of uneasiness in the Pacific. On the Asiatic side disturbances were taking place daily. Some were so slight that they were not noted, or else so far away that the effects did not reach the delicate mechanisms.

In February of 1923, a series of intense shocks left a wide trail of ruin from the Society Islands in the South Seas to the Aleutian

Abandonment of the Old Method of Bamboo Construction Was Blamed for the Collapse of Many Buildings that Buried the Occupants Beneath Tons of Bricks and Timbers

Caught by the Inward Rush of Waters, Noon Crowds on the Docks at Yokohama Were Swept Up Like Dust, While Small Boats and Automobiles Crashed Against Building Walls Along the Shore

group far to the north. Destruction reached its height in the Hawaiian Islands, where a great wave swept inland, beaching ships, wrecking sea walls, and causing a number of deaths. In all, this mighty tremor shook an area 5,000 miles in length.

Two months later the American coasts were touched. Mexico felt shocks and a volcano in Ecuador caused terror in that country by casting up white-hot stones and ashes. A short time later the trail wound into southern Europe. Early in June, Mt. Vesuvius, that veteran of catastrophes in Italy, let loose with a blast that shook the countryside. Tremors of the earth accompanied its eruption, and while they caused considerable alarm, did little damage. In a few days it subsided, but as though contesting for the center of the stage, Mt. Etna, in Sicily, then broke forth, attaining such intensity that the inhabitants of near-by communities were sent fleeing for their lives.

With all these terrifying works of nature dotting our globe, the very danger they threaten seems to endear them to those living within their shadows. After the crises are past and the terror is forgotten, new villages replace the ruined ones and other homes rise on the sites of the old ones. The people return to take up their interrupted peace until another grim trick of the earth forces them to flee the mysteries of nature's underground powers.

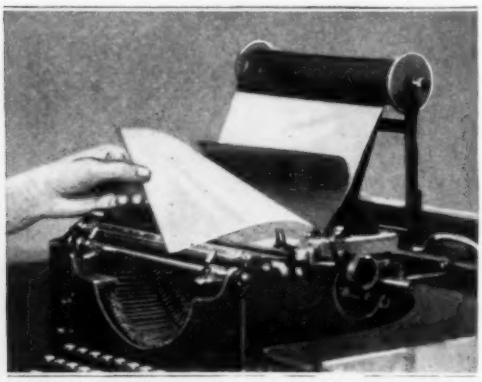
AMBERGRIS, GOLD OF THE SEA, MAY HAVE CHEMICAL RIVAL

Synthetic chemistry threatens the value of ambergris, a substance disgorged by diseased whales and which is used in manufacturing expensive perfumes. It has been more valuable than gold in the past and highly prized by chemists. Many sailors have won fortunes by picking up accumulations of this peculiar article found floating on the sea. An exceptionally large find was 926 pounds discovered off the coast of Australia that sold for 135 thousand dollars.

¶Gas production in the United States is reported to total 330,000,000,000 feet annually.

CARBON PAPER ON TYPEWRITER ROLLS FROM FOLDING RACK

To eliminate waste of carbon paper, a folding rack which can be attached to a typewriter has been devised. It feeds the



Carbon-Paper Reel on Typewriter Which Saves Much Stock and Time When Making Copies

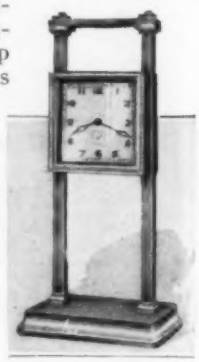
tissue from a roll. With this device, it is claimed that great saving will result, because all of the coated surface is utilized instead of only a part, as is the case with sheets. As it is seldom necessary to touch the work, correspondence is kept free from blurs and finger marks. Placed in the typewriter between the letterhead and the copy sheet, the amount of carbon required is governed by the size of the letter. When the original and the copies have been removed from the machine, the carbon automatically returns to the reel. A cutter is provided to trim off worn parts, and hinges allow it to be folded against the typewriter for lowering into a desk.

CRADLE OF MANKIND MAY LIE BENEATH ASIATIC DESERT

What some scientists believe to be the birthplace of mankind has been discovered by an expedition in the dreary waste of the Gobi Desert in Asia. While fossils of the first men have not been unearthed, their tools and the bones of the woolly rhinoceros, which they hunted, were dug up by the explorers, who are planning a second trip to the site to search for remains of the first representatives of the human race. Stone implements of extreme age, spears and hammers that have lain for centuries partly buried by the drifting dunes, are included in the find. While the naturalists were excavating in this arid region, others opened up a mound in Honan, China, that had stood undisturbed since 900 B. C. It contained over 100 bronzes, some inlaid with precious stones and crusted with gold. This treasure is valued at $500,000, not reckoning the scientific worth of the articles which bear information of an early age.

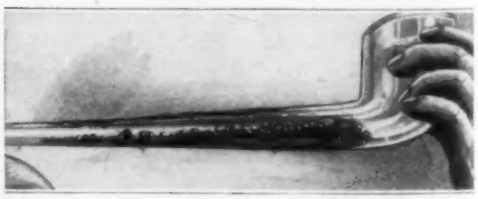
SQUARE CLOCK MARKS TIME BY SLIDING DOWN HOLDER

Its own weight causing it to slide slowly down two uprights that serve as a frame, a square clock being made needs no springs to keep it running. Raising the instrument to the top of the holder puts its works in motion which is communicated by gears toothed in notches on the metal standards. The drop requires 32 hours to complete, when the clock stops. Because its power does not vary, the timepiece is said to be more accurate than the spring-controlled types. Its position on the holder quickly tells the length of time it has run after each "winding."



FISH EGGS SHIPPED IN ICE HATCHED IN GLASS TUBES

Glass tubes filled with water are used as incubators for trout eggs at hatcheries to which they are shipped packed in ice. In these crystal pipes, the young are reared and sheltered until large enough to be transferred to tanks. Thousands of the finny youngsters are born every year at several state institutions devoted to their



Water-Filled Glass Tube with Eggs of Trout that Were Shipped from Distance Packed in Ice

cultivation. When of sufficient size to take care of themselves, they are turned loose to stock streams, lakes, and rivers in various parts of the country.

¶Not until they are 200 years old do mahogany trees reach their full height.

ARTIFICIAL "WOOD" MAY SAVE SHRINKING TIMBER SUPPLY

In an attempt to save the rapidly dwindling lumber supply, experimenters have developed artificial "wood." It is a combination of asbestos and portland cement which will not rot or deteriorate under exposure to weather. In making this imitation lumber, the mineral is mixed with cement and other materials until the mass is as smooth as cream. Then it is poured into molds and pressed by a hydraulic machine into thin boards and sheets. The finished product can be sawed, drilled, shaped, painted, grained, and nailed like the natural article, and will not burn. It is now being fashioned in flat slabs which can be cut for window and house trim, roofs, partitions, and wall board. For building fireproof motion-picture projector booths, the new product is said to be ideal.

LIGHT CLAMPED TO A FINGER AIDS WORKER AT NIGHT

So the user may have free use of both hands, a small electric lamp, that can be worn on the finger or held secure to various objects by an adjustable clamp, is being made in Europe. It can be attached to the handle of a safety razor for shaving in the dark, to tools for working on an auto, on a clock for use at night, to a

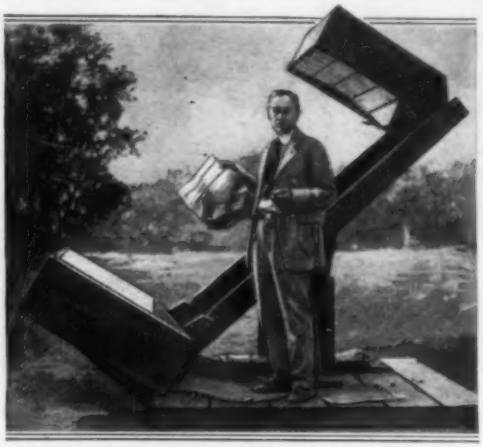
Light that Permits Free Use of Hands while Clamped to Finger or Some Object

music stand, and is serviceable in many other ways. So the weight will be slight and the length and width less than an inch, electricity is carried by wires to the bulb from a battery or house current through a transformer. Watchmen carry them, with the battery in the pocket.

¶Of the world's railroad mileage, 40 per cent is possessed by the United States.

"CANNED SUNSHINE" FOR HEAT TO AID FUEL PROBLEM

"Canned sunshine" for heating purposes is the object of experiments being conducted by a Pacific-coast inventor. He



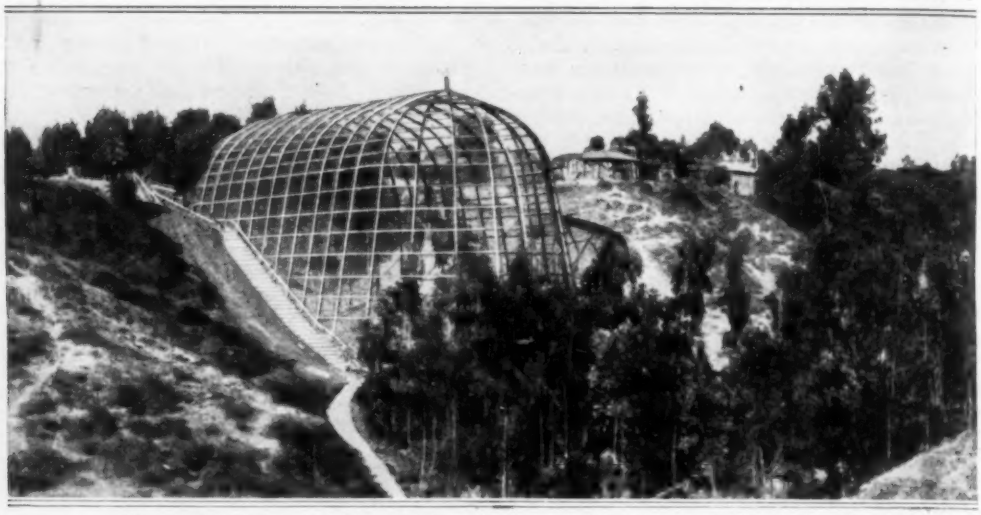
Harnessing Solar Rays to Make "Canned Sunshine" Which May Aid in Solving Fuel Problem

has developed heat from sunlight that will burn coal, melt lead, and generate a gas which he believes can be utilized for propelling power. This is accomplished by a series of mirrors that reflect the rays into a concentrator which produces a temperature of 2,800 degrees. By burning chemicals in this apparatus, cooling them, and then sealing the residue in air-tight containers, the expert expects to market an energy that can be used in many ways.

BEES, COLOR-BLIND, MUST LEARN WAY BY EXPERIENCE

Bees are color-blind and they learn their way about by experience rather than by instinct, according to tests recently conducted by scientists. The experts show that to these honey-making insects, red and black look alike, orange and yellow are the same as green, and there is no difference in the appearance of blue, violet, and purple. However, they can see ultra-violet rays, which are invisible to the human eye. It was found that the guiding influence which takes them back home is nothing more than experience. It has been long known that bees locate hives quicker, the longer they have occupied them. During the experiments, some were put to sleep by ether, taken from a new hive, and moved 12 yards away. On the third day 30 per cent returned and 90 per cent had reached home on the eighth day.

RARE BIRDS GET FLIGHT SPACE IN LOFTY CAGE



Gigantic Bird Cage that Permits Great Freedom of Flight for Its Feathered Inmates

Rare birds on exhibition in a Pacific-coast zoo can get needed exercise in the open air while inclosed in a gigantic outdoor cage, 85 feet high at its loftiest point. Within this structure, the winged creatures enjoy greater freedom than when they are imprisoned in an indoor inclosure, since the range of flight is less restricted. For the convenience of visitors, a cement walk and stair surround the bird house. The aviary is expected to greatly prolong the lives of its inmates.

CROPS OF SUNSHINE AND CLOUD GIVE U. S. WEALTH

Just as population and wealth are concentrated in certain parts of the United States, so there are sunshine and cloudy centers, where these two kinds of weather mean dollars and cents to residents. Most of the former lie east of the Mississippi River, but the sunshine center of the country is situated in the extreme Southwest, near the mouth of the Colorado River. Yuma, Ariz., furnishes the dot on the map for the compass to draw a circle inclosing a region into which sunbeams pour almost ceaselessly during the daylight hours. Only 18 days in the average year can be called cloudy in this city, and in a roughly circular area extending about 100 miles from it in every direction. Considering both the length and number of days, this territory, embracing the southwestern part of the state, gets 85 per cent of all the sun's rays aimed at it in a year, while neighboring sections are only 5 per cent behind. Sunlight is capitalized here because it may be said to inclose the portion of the United States that sells its climate the year round to thousands of tourists and health-seekers. As the percentage of fair days grows less with distance from this center, the rainfall becomes greater, so that agriculture may flourish without irrigation. Beyond the mouth of the Mississippi, the sunshine lines bend northward, taking in southern Florida, where this commodity of nature has a money value in the resorts. The clouds gather thickest in western Washington, near Puget Sound. Here half the days are cloudy and about 30 per cent partly so. About this little section is a much larger strip only slightly less marked by cloudiness. But there is a monetary compensation for this lack of sunshine, for heavy rainfall and snowfall, with the high mountains, give Washington a greater potential water power than any other state. There are two secondary "cloud grounds" in the East—one on the southeastern shore of Lake Ontario and the other in the upper peninsula of Michigan, where 75 per cent of the days are wholly or partly cloudy.

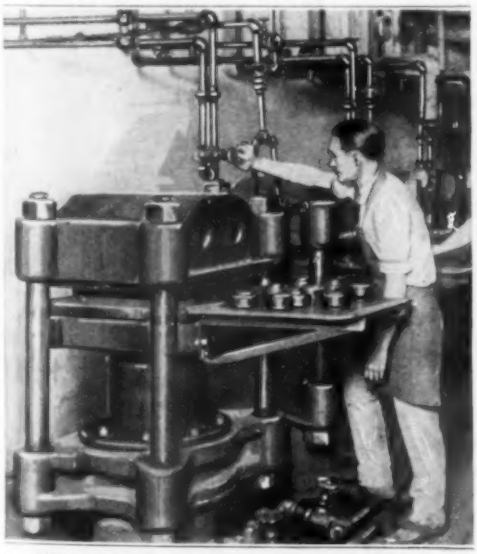
¶ When he found that some animal had bitten through one of the eggs under a setting turkey hen, a southern man patched the hole with rubber from an auto inner tube. A lively turkey was born.

GLASS IS CUT ON TWO SIDES TO REDUCE THE WASTE

Marking glass on both sides so that it may be broken easily, thus reducing the amount of waste from faulty operation, a glasscutter is being made that turns out circular as well as straight pieces. As the pressure is applied evenly to the sharp wheels by an arrangement of springs, the life of the instrument is said to be increased. A novice can readily manipulate it. By adjusting a single screw, thicknesses up to ¾ of an inch can be handled with ease. The apparatus shapes circles a foot and a half in diameter, while a gauge can be set at any desired length for straight cutting. With this machine, it is said, an operator can cut four times as much glass as he can by any other method.

PROCESS FOR GOLF BALLS GUARDED AS SECRET

Considerable secrecy is said to surround the manufacture of golf balls. Each maker has his own process which he takes great care is not revealed. In forming some of the little spheres powerful hydraulic presses are used to force them into shape and to exclude undesirable gases and air from the interiors. However, there is no standard machinery for the production of the article and every



In Making Some Golf Balls Much Depends on the Expert Handling of These Hydraulic Presses

firm designs its own. Experts claim that through loss alone over thirteen million of the balls are consumed each year.

ELECTRICITY FROM WINDMILL TAKES PLACE OF COAL

To generate electricity cheaply without using coal, because of a fuel scarcity and its consequent high cost, a European in-

Windmill That Charges Storage Batteries Where Coal Is Too Costly to Make Electric Power

ventor has built a windmill that charges storage batteries. It is operating so successfully he is making eleven more. Mounted on a tower about 50 feet in height are big propellers that generate 40 horsepower in a moderate breeze and 70 in a strong wind. In a roundhouse on the ground, connected with the top by a shaft, are the generator and batteries.

DASH THROUGH FLAMES EASY IN FIREPROOF SUIT

Made of patented asbestos cloth, a life-saving suit has been invented that is said to successfully resist heat and flames and to protect the wearer from injurious effects of smoke. With this garment, it is claimed a person can enter a burning building, walk through hot embers and blazes of fire, and return unharmed. Oxygen is supplied from a tank fastened inside the garb. In a recent test, the inventor carried documents from a flaming structure and, after it had collapsed, lay down in the glowing coals without apparent injury.

With Death at the Throttle in Mexico

Dynamite-Laden Trains Used to Spread Destruction During Years of Guerrilla Terrorism

By SIDNEY McNEILL SUTHERLAND

IT IS the ostensible purpose of a Mexican revolution, always proclaimed in flamboyant rhetoric and sometimes inspired by a sincerity born of self-hypnosis, ultimately to attain justice; the righting of some wrong. The real reason often is to be found in the sight of a sty at feeding time.

Mexico is composed of thirty states; and, since 1910, each of the thirty has, at sundry times, been hunting justice with a carbine. Guerrilla warfare became a pastime for the azotacales. Insurrection is contagious; one commonwealth revolts and presently fifteen will be aflame at one time—each seeking a different brand of justice. And whether there is one general uprising against the president (and secretary of treasury), or whether there are fifty baby rebellions against local tyrants (and municipal exchequers), the hundreds of generales and the thousands of sublevados have agreed on three things:

First—Force the party in power out.

Second—Destroy the railroads.

Third—Down with the gringoes.

The first means loot and release from work; the next, gratification of the strange Mexican obsession to wreck all real proof of Porfirio Diaz' superior mentality; and the last, the furnishing of a grito, or rallying cry, to keep the discordant elements united behind their leader's ambitions and avarice.

In my rather extensive wanderings about Mexico in the wake of divers justice hunters, I have sometimes voiced a courteous comment on the wanton and utterly needless vandalism that wrecked the transportation systems of that country.

"General," I would say to whatever unlettered patriot I happened to be accompanying; "general, do you think it is necessary to blow up that bridge?"

"Señor, it is," the Napoleon of the West would reply, as he rolled a cornhusk cigarette. "By cutting the line at this point, I forestall pursuit. Having crossed this creek and destroyed the span, naturally our enemy cannot overtake us. This is tactics."

"True. But suppose we run into some more enemy down the road, and your excellency's profound knowledge of strategy should counsel retreat—"

"Señor!" he would thunder, twisting his mostacho and thumping his knuckles against his chest—"Señor, be assured that General Don Petronillo Rodriguez de la Corona y Carolampio never retreats!"

"Exactly. But if—"

"A temporary withdrawal, perhaps, whilst I rearrange the forces under my command and orient myself," he would interrupt again, transfixing me with a lowering stare. "But 'retreat!' The word is most odious to any Mexican officer, and especially offensive to the ears of one who to this hour, has never yielded a step in the presence of the enemies of justicia, fraterni-

Gratification of the Desire to Wreck Everything United the Elements Behind Avaricious Leaders

Careening Around the Curve, the Runaway Dynamite Engine Struck the Train with a Deafening Roar. The Ground Heaved, Cars Were Splintered, and Soldiers Tossed in All Directions

dad, igualdad y constitucionalismo. If—and, mind you, I decline even to entertain the shameful thought—if I should decide momentarily to lead the foe into a trap by the sagacious feint of apparent retirement, we can abandon the train and gallop to the nearby sierra."

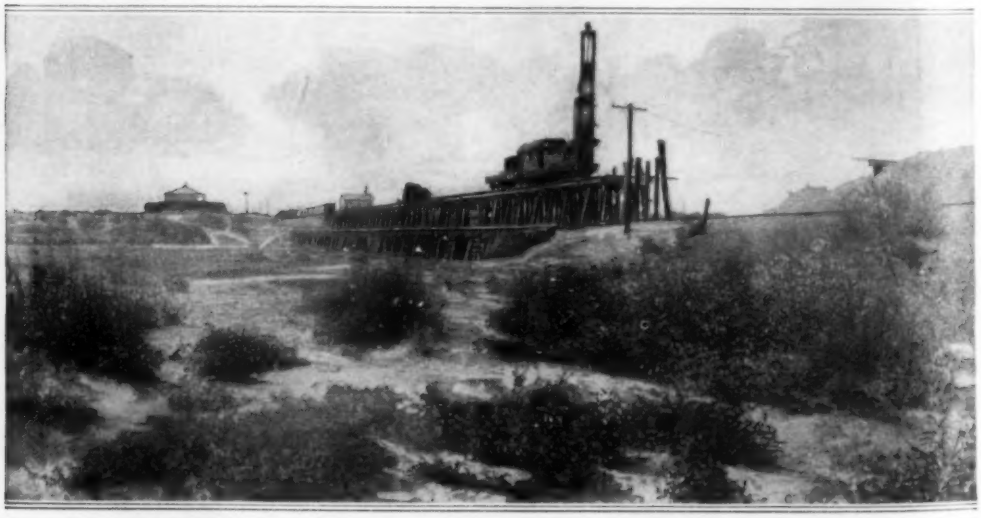
"Well," I would shrug my shoulders, "it seems a pity to tear up this line. It stops all passenger traffic, and it is the only means the poor peaceable noncombatant middle class can use to ship its grain and goats to market, or get the few things it requires from the larger cities. Everywhere I've been throughout this country, general, I've seen the havoc wrought by the different armies; and every blow struck at the railroads is a heavy, may be an irreparable, blow at the recovery of this splendid land. To an outsider—and tendering the observation in the most disinterested and respectful manner—it does seem as if the revolutionists might spare the roads."

Instead of Repairing Damaged Roadbeds, New Ones Were Built of Inferior Material Alongside Them

But ever my advocacy of the poor railways fell on ears as deaf to common sense as they were unwashed.

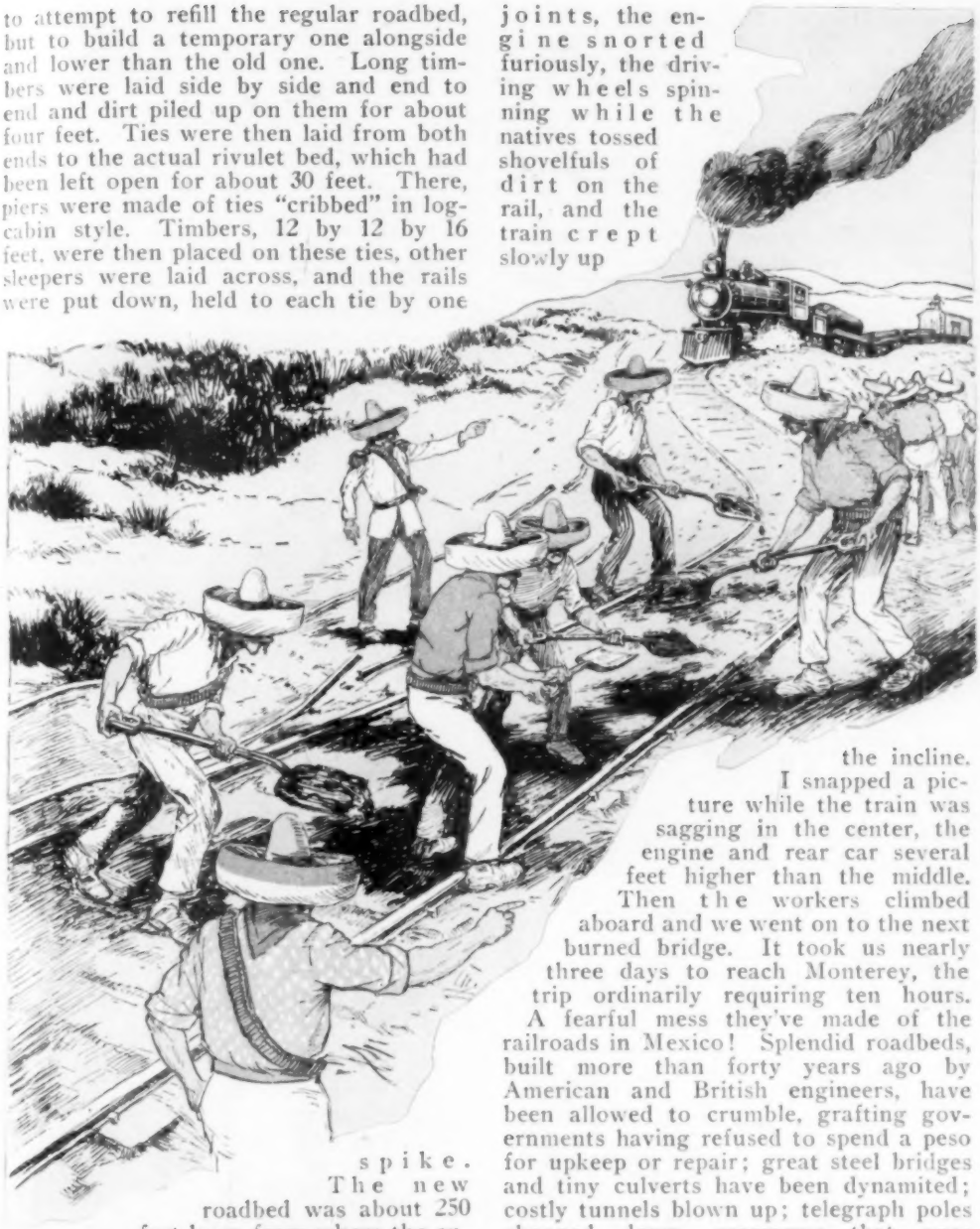
I left Nuevo Laredo on May 15, 1920, having hastened to the border at the orders of a Chicago newspaper when we got word that President Carranza had fled from Mexico City a jump in advance of General Alvaro Obregon and his Sonora Yaquis. The road to Monterey, I was told by Colonel Borquez, in command of the Nuevo Laredo garrison, had been cut in a dozen places by his own men when they came north. But I might go south at dawn with the first repair train, he said. I did, and my camera tells something of the story.

About ten miles out we stopped to pick up some ties. Presently, we came to a culvert which had been blown up to keep the Carranza troops in Monterey from following the rebels in their march on Nuevo Laredo. The laborers and their armed escort alighted and, after prolonged conversation and numerous cigarettes, went to work. It was decided not



Great Bridges Built by Engineers of Forty Years Ago Were Wrecked and Forgotten. Temporary Structures to Replace Them Were Made Chiefly of Telegraph Poles and Railroad Ties

to attempt to refill the regular roadbed, but to build a temporary one alongside and lower than the old one. Long timbers were laid side by side and end to end and dirt piled up on them for about four feet. Ties were then laid from both ends to the actual rivulet bed, which had been left open for about 30 feet. There, piers were made of ties "cribbed" in log-cabin style. Timbers, 12 by 12 by 16 feet, were then placed on these ties, other sleepers were laid across, and the rails were put down, held to each tie by one spike. The new roadbed was about 250 feet long, from where the engine waited to where the repaired track reached the old one.



When the engineer decided it would do, the train, consisting of the engine, oil tank car, three flat and two box cars, was started slowly. The untamped dirt settled, the ties creaked, the brakes whined, the Mexicans yelled all sorts of advice, and the train slid down the loose, yielding rails. Lurching from side to side and squeaking in each of its rusty joints, the engine snorted furiously, the driving wheels spinning while the natives tossed shovelfuls of dirt on the rail, and the train crept slowly up the incline.

I snapped a picture while the train was sagging in the center, the engine and rear car several feet higher than the middle. Then the workers climbed aboard and we went on to the next burned bridge. It took us nearly three days to reach Monterey, the trip ordinarily requiring ten hours.

A fearful mess they've made of the railroads in Mexico! Splendid roadbeds, built more than forty years ago by American and British engineers, have been allowed to crumble, grafting governments having refused to spend a peso for upkeep or repair; great steel bridges and tiny culverts have been dynamited; costly tunnels blown up; telegraph poles chopped down, crossarms that once hummed with fifty wires now carrying one; stations burned and replaced by box cars; rails pulled up, heated in the middle over a bonfire and bent double around poles or trees to make them useless; thousands of freight cars given to flames, their blackened skeletons filling the yards and sidings for miles; ancient engines have been patched and repatched for years by the natives, all the American employes having been chased out in

April of 1912; ties, unreplaced for thirteen years, have been cut in twain by the rusted rails, the outer ends either hanging by a shred, which constantly grows thinner as the release from the weight of passing trains jerks the spikes farther out, or lying in the weed-grown right of way, the steel resting only on the ground; passenger coaches filthy and insanitary, their windows broken and the varnish scaling off.

Ruin, desolation, and hopelessness everywhere mark the collapse of Mexico's railways, the consequence of Mexico's experiment in revolution.

From Monterey to the capital the trip was normal, the damages having been repaired. At one place, where a branch line runs to the American Cuatro Cienegas mining camp, they had no engine. I saw forty peons shoving a gondola piled with lumber up a rather steep grade. The gringoes told me they had no idea when they would be allotted an engine, but that they could count definitely on the exact hour when the local tax collector would make his appearance.

Blackened Remains of Fired Railway Coaches, and, Above, Peons Substituting for an Engine Moving Lumber Cars

Early in June, Carranza having been disposed of in the customary, bullet silencing manner, I went up to Escalon, Chihuahua, to join General Joaquin Amaro, a genuinely capable young officer, whose nondescript army of 5,000 soldiers was chasing the late Pancho Villa. He was kind enough to offer me quarters in his private car—later he gave it up and we moved into a box car—and as we passed Corralitos I told him the story of the famous engagement there in January, 1912, between General Gonzalez-Salas, Madero's minister of war, and Pascual Orozco, who had revolted. I had gone north with Salas as representative of New York and Mexico City newspapers.

Orozco made his stand in the long chain of low foothills which stretch east and west across the tracks, their summit about half a mile north of the tiny station and water tank. He probably had 2,500 well-armed cavalrymen, who had concealed themselves behind the desert chaparral. They had several machine guns; and, straddling the road, were prepared to dispute the further progress of the government troops.

Salas halted his four trains, the first at Corralitos, the other three stretching for a mile and a half down the track; sent 1,000 men to the west to keep Orozco's thin right wing engaged; and deployed the remainder, 4,000 infantry and artillery, east of the tracks to dislodge the main body of rebels.

From Corralitos to a point about half a mile north, the tracks, slightly ascending to the higher ground, run straight; then they suddenly disappear around the shoulder of a hill, reappear higher up about a mile farther on, continue in sight for a quarter of a mile, and then vanish into the plains beyond the foothills.

General Salas, some of his staff and I arose before daybreak, walked from his car at the rear of the last convoy to the first engine, under the water tower. From the cab we watched the battle commence on our right wing. The 3-inch guns opened the attack, sending their shrapnel above the heads of our men into the hills. The troops would run a few yards, drop behind a clump of cactus or mezquite, fire a few times, and advance a bit farther. On our left the soldiers merely kept the bandits back.

As the morning wore on, the wounded began to come in, either limping alone or carried by companions. Soon there were several hundred lying on the ground along the right of way in the shadow of the box cars. There they were min-

Every Blow Struck at the Railroads Was a Heavy Thrust at the Recovery of Mexico

istered to by their women and the doctors. By noon the government forces had almost reached the foot of the hills—the artillery was too much for the insurrectos. Presently, the orderlies brought our luncheon and a case of iced champagne. While we were dining, the Mexicans indulging in fervid complements and congratulations, I happened to glance to the north; and what I saw caused me to let out a yell which so startled Salas that he dropped his bottle. The officers leaped to their feet and followed my finger with their eyes.

On the short stretch of track visible between the hills, was a locomotive running backward down the incline.

"Dinamita!" I shouted.

"Locomotora ciega!" they echoed my cry.

Each of us knew what it meant. Orozco had loaded an engine with dynamite, fired the fuses, and started it downhill with throttle wide open, crewless but manned by Death.

I don't know which of us reached the ground first, but I know who led the way to the nearest hills on our left!

When I reached a knoll about three hundred yards away, I threw myself prone behind it and looked back. The blind engine, its piston rods racing at full speed, careened around the curve and came down the tracks, its momentum increased by gravitation at every telegraph pole. From the forty box cars of the first train, women and children were leaping, screaming, and running about.

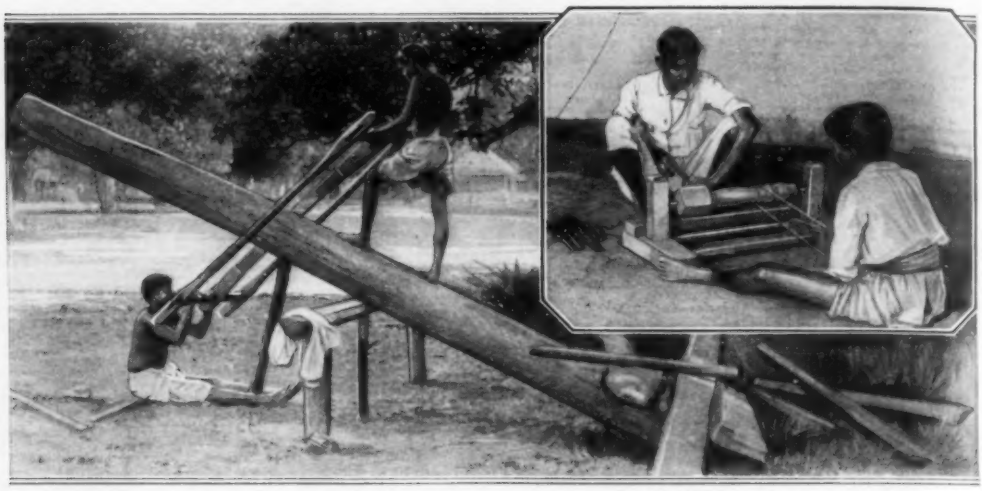
The runaway engine hit our locomotive with a deafening roar, the dynamite exploding at the moment of impact. The ground heaved, the first ten cars were splintered, dozens of wounded men and their women were torn to fragments, and a hole 50 feet by a hundred was blown four yards deep where the engines collided.

The battle became a panic. As far as we could see, soldiers arose, looked in our direction, and began running toward the three trains down the road. We were there to receive them!

In vain did Salas plead and storm and threaten. The horror-stricken men refused to turn and face the Orozquistas pouring out of the hills. The troops scrambled aboard in mad confusion, and the trains backed down the line to the base at Escalon, the rebels on horseback making a running fight of it as long as they could keep up.

And that evening, the minister of war, seated in the darkness, solved his problem as best he knew how, wiping out the disgrace with the 45-caliber bullet he sent crashing into his right temple.

INDIA'S WOODWORKERS SPURN SAWS AND LATHES



In India, Where Native Woodworkers Prefer Their Feet and Hands to the Most Modern Sawmill Machinery in Dressing Lumber for the Builder

With a labor market always flooded with cheap but skilled help, India can produce hand-dressed lumber at a cost below that of the machine-equipped sawmills of western countries. Methods that were employed long before the days of belt-driven wheels are still used. After the bark has been removed from a log, it is placed across a trestle and weighted to raise one end. Two men then cut it into boards with a crude ripsaw, one working from the ground and the other standing above. Wood turning is performed on a roughly made frame lathe held firmly by the feet of the squatting carpenter and his assistant, who rotates the piece by pulling on a cord looped around it.

COOKER ON RADIATOR OF AUTO PREPARES MEALS QUICKLY

So that automobile tourists may prepare their dinners while en route, a cooking apparatus has been made to attach to the top of the radiator of the car. In appearance, it somewhat resembles the outer chamber of a double boiler, but with an aperture in the bottom where it is screwed in the place of the radiator filler cap. Hot water coming from the cylinders of the motor provides sufficient heat to prepare a meal quickly.

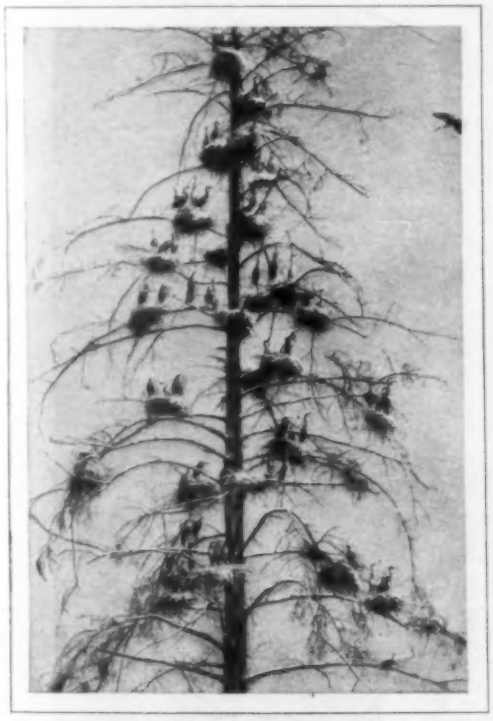
ARTIFICIAL LUMBER OF HEMP TO CUT BUILDING COSTS

That experiments in the manufacture of artificial lumber will result in new building materials to supplement the diminishing forest product, is being predicted generally by western lumber interests. Government figures show that America's building program for this year calls for the expenditure of almost $1,000,000,000 in excess of 1922. The homes needed today, averaged at $5,000 each, amount to about $8,000,000,000. To meet this demand, experiments have been made in an effort to produce "synthetic lumber" from logging wastes, which are ground, chemically treated, and pressed into boards. Another plan is to utilize the hemp left over from the manufacture of cordage products in making "boards" which could be sold at a 50-per-cent reduction. If successful, this would open a new market for a farm product from land either too poor for other crops or now lying idle as the result of the collapse of the rice-growing industry in the

San Joaquin and Sacramento valleys. Hemp can be grown almost anywhere in the United States, but the high percentage of waste has heretofore limited its cultivation. Five acres of hemp, it is estimated, will produce enough waste to build a bungalow and furnish it with rugs and paint products. A native of China, the plant grows to great height, is a soil conserver, requires no expert cultivation, and yields sure returns.

GIANT HEMLOCK IS SANCTUARY TENEMENT FOR WILD BIRDS

Departing from their custom of nesting in separate trees, many heron, noted for their shyness, have built their homes in a giant hemlock tree close to the highway of a Canadian park, where a million automobiles pass yearly. As the park is a sanctuary, the birds are never disturbed. These feathered architects have so arranged the nests that none comes directly under others. In obtaining an unusual photograph of their skyscraper home, a photographer risked serious injury in climbing a near-by "king" of the forest. The picture showed 27 nests and 87 young.



Feathered Architects Who Have Turned Tree Beside Busy Highway into a Tenement

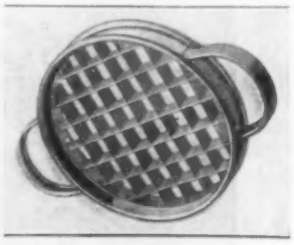
SOLID-GOLD RAIL FOR SPOT WHERE HARDING SPOKE

To commemorate the opening of a branch-line railroad in Utah, by the late President Harding, a solid-gold section of a rail, 9 inches long, was spiked into the tracks at the point where he stood in delivering his address. Left there for a period, under guard, it was later removed and placed in the museum at the state capitol. President Harding's train, which carried him to Seattle on his journey to Alaska and later bore his body from San Francisco to the nation's capitol, was the first to pass over this new route.

Bit of Golden Rail from Spot Where Harding Spoke Is Kept in Museum

POTATO IS CUT INTO STRIPS WITH STROKE OF SLICER

In one stroke of a recently patented round, metal cutter, potatoes are sliced into many pieces of uniform shape for frying. It is made to speed up work and to eliminate use of the knife. Strips of metal form a network of squares which cut peeled potatoes when pressed down by two handles.



¶The average annual gasoline consumption for each passenger automobile in the United States is estimated at 360 gallons.

Photo by Charles W. Doutt

Volcanoes of Flame from Steel-Plant Furnaces Turn Nights into Days

STEEL-MILL GLARE UNDIMMED BY THE EIGHT-HOUR DAY

With the eight-hour day being put into effect by steel companies all over the country, production has continued without a single break. Affecting some 60,000 workers, the change is being made gradually, but it is expected that it will be completed in less than two months. As many of the employes already were on this basis, the abolition of the 12-hour day has mainly affected furnace men and unskilled laborers. Introduction of the three-shift plan has had no visible effect in decreasing the output, although increases in prices have been forecast.

ONE-MAN POWER PUMP USED TO FIGHT FOREST FIRES

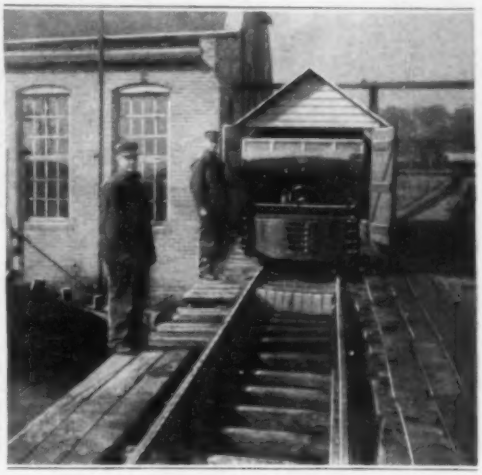
Mounted on a tripod like a camera, and but little larger, a portable one-man pump has been made to combat forest fires. Weighing less than 60 pounds, it can be carried easily, strapped over the shoulders like a knapsack. One leg of the tripod is a hollow iron pipe through which water is drawn when the machine is set up in the bed of a creek or pond. Using 50 feet of one-inch hose, it will throw a stream 81 feet from a ⅝-inch nozzle. By

Portable One-Man Pump, about the Size of a Camera, That Is Designed for Quick Operation

loosening four bolts, the engine can be lifted from the pump, the legs can be removed and the whole device dismantled.

PEAT BOGS FURNISH RIVAL TO COAL AS POWER FUEL

Beds of peat believed to afford an almost inexhaustible source of fuel are being worked in the middle West to supply ma-



Where Peat Is Converted into Fuel That Can Be Used for Power Purposes

terial that can be used as a substitute for coal. A process has been developed by which a high-pressure machine extracts the moisture and converts the combustible parts into dry and readily burned lumps. In preparing peat for market it is first screened and then graded for different purposes. It is said that it can be used in almost every case where good power fuels are required, with no ill effects on fire boxes or other sections of the boilers.

STONE-AGE ART STUDIO FOUND AMONG HIDDEN CAVERNS

While exploring the underground source of a small river in the south of France recently, an adventurer discovered numerous clay models of animals that existed in that country 25,000 years ago and which have been extinct in Europe for centuries. In the central chamber of a series of caves, the walls of which were decorated with rough mural paintings, was the headless figure of a bear cub, and near it, the skull of a full-grown beast, left as though the artist had been suddenly called from his task and never returned. Against the side of the cavern were two forms of tigers or lions, of which no prehistoric counterpart has ever been unearthed in that region. Like a number of other objects, they were covered by stalactites.

ACETYLENE TORCH LIKE PISTOL CONTROLLED BY TRIGGER

Lightweight acetylene torches constructed along the lines of an automatic revolver are used in Europe for cutting

Acetylene Torch Resembling Revolver That Shoots Flame from a Nozzle

metal. The pistol grip permits a firm, steady control of the flame, which is turned on by pressing a trigger. Two tubes carry the air and gas to a chamber from where it passes to the nozzle. Owing to the ease with which it can be handled, the torch is a convenient aid in reaching corners and cutting steel beams formed into odd shapes.

TEAPOT SHAPED LIKE SQUARE HIDES SPOUT AND HANDLE

Stacking easily in dining-car pantries, a square teapot that conceals its spout and handle in its body has been designed for railroads. Instead of the usual spout protruding from the bowl, there is an opening in one of the upper corners, while the handle is an indentation on the opposite edge. Minus projecting parts that are liable to be broken off, the utensil is said to have a longer life of service than the rounded models.

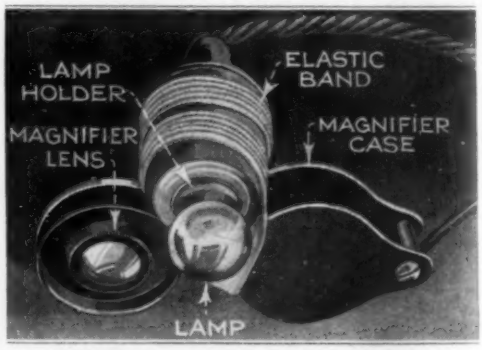
After oil has been extracted from castor beans, bricks are being made of the pulp.

GROWTH OF U. S. NAVY HALTS WITH BIG DREADNAUGHT

Surpassing all other American warships of its class in size, gun power, speed, protection, and control, the "Colorado," recently completed, is the last battleship the government will build for some years, as stipulated by the international naval agreement. Eight 16-inch guns constitute its main battery. Twelve 5-inch guns are mounted for torpedo defense, and eight anti-aircraft rifles, a catapult for launching airplanes, and two torpedo tubes make up the remainder of its armament. The sea fighter is 624 feet long and can attain a speed of 21 knots an hour. As electric drive permits full use of its entire power either in forward or reverse motion, the ship can maneuver with great ease and rapidity. Gun-sighting and fire-control systems allow it to fire quicker than other warcraft, it is said. Heavy armor in protective belts is especially designed to resist airplane and submarine attacks. Oil is used for fuel.

LIGHT IN MAGNIFYING GLASS TURNS NIGHT INTO DAY

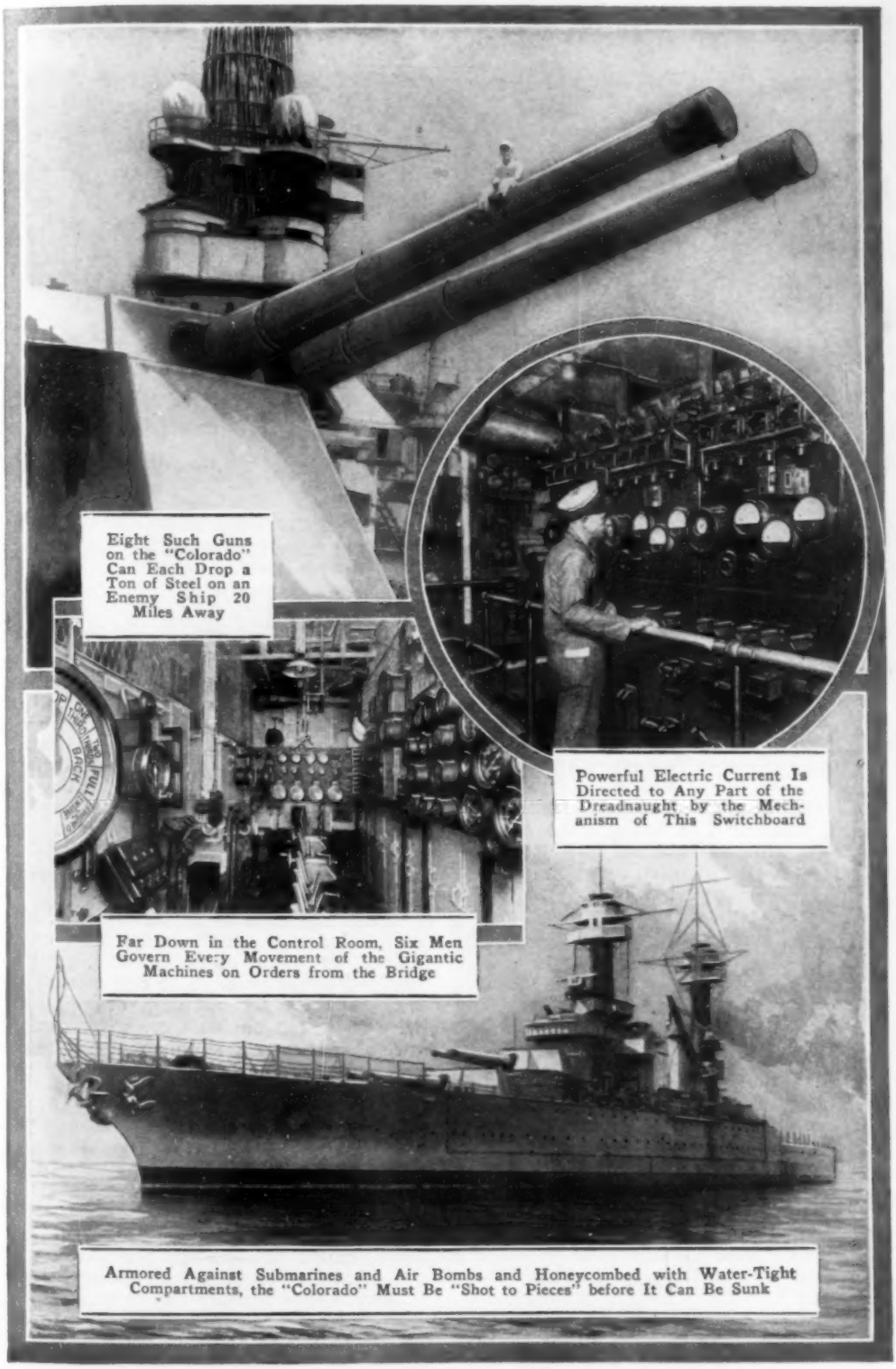
To permit the use of a magnifying glass in the dark, a small electric-light attachment has been devised in England. Mounted in a short wooden socket, the



Light Magnifying Glass for Use of Scientists in Outdoor Night Work

lamp, an ordinary low-voltage bulb such as is supplied with pocket flashlights, is fastened to the magnifier by a rubber band. A short length of flexible cable leads to the battery. When placed in the pocket, the globe is protected by the conical shape of its holder and a thin brass tube that slips over it, being closed at the end by a cork stopper. It is of value to scientists in outdoor work.

OUR LATEST, PERHAPS LAST, WORD IN SEA WAR



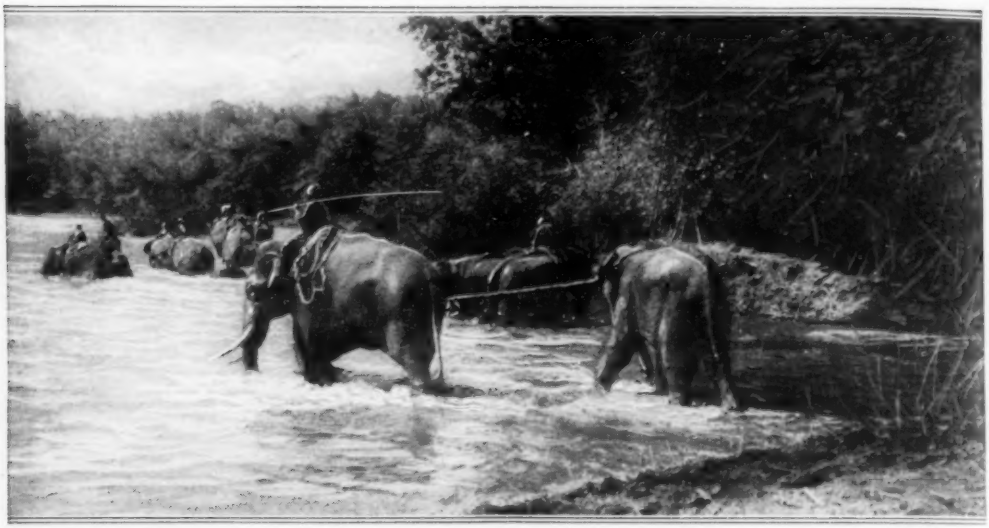
Eight Such Guns on the "Colorado" Can Each Drop a Ton of Steel on an Enemy Ship 20 Miles Away

Powerful Electric Current Is Directed to Any Part of the Dreadnaught by the Mechanism of This Switchboard

Far Down in the Control Room, Six Men Govern Every Movement of the Gigantic Machines on Orders from the Bridge

Armored Against Submarines and Air Bombs and Honeycombed with Water-Tight Compartments, the "Colorado" Must Be "Shot to Pieces" before It Can Be Sunk

LOGGING ELEPHANTS FOR CANADIAN FORESTS

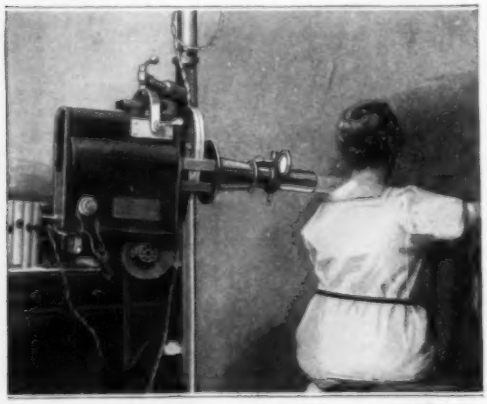


Elephants Performing the Work of Men and Machines in Hauling Heavy Logs in Burma: Although They Appear Slow, Their Efficiency Has Been Proved

In British Columbia lumbermen are said to be considering the feasibility of introducing elephants to work in their logging camps, as they do in Burma. It has been shown that the elephants are more efficient and actually cheaper to employ than machinery. They appear to be slow, but they are not. The only points that work against their use in Canada are the winters and the freightage of their hay.

LIGHT RAYS CURE FOR BURNS ONCE CONSIDERED FATAL

Light rays projected from a recently devised machine are being used to cure burns that formerly would have been considered fatal. Operated by electricity, the machine casts its brilliant beams in much the same manner as a magic lantern, to which it bears a resemblance. The light, it is said, aids nature in closing wounds and reconstructing tissue. Filtered through lenses, the healing rays may be either concentrated on one spot or diffused over the body.



Light Rays from Electrical Machine Being Used to Cure Burns and Skin Disease

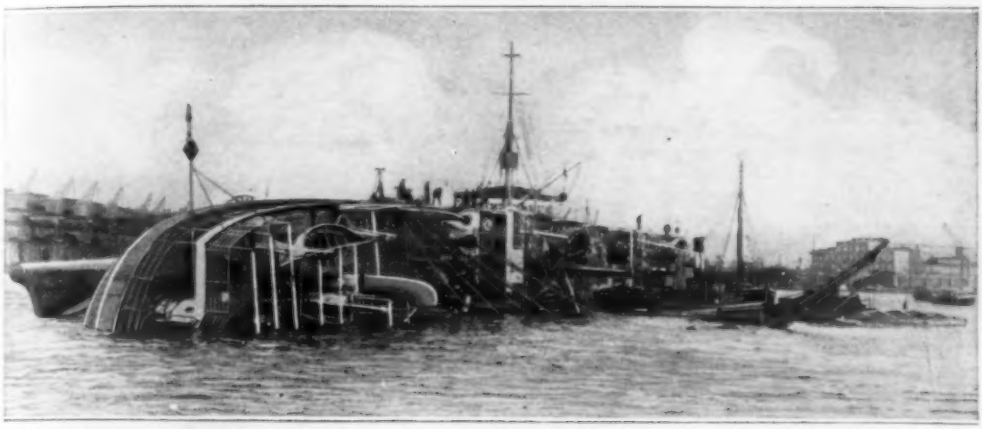
'GATOR ACTS AS A GO-DEVIL

Made fast to a wire and lowered down a manhole, a small alligator recently helped to open up a passageway in a clogged sewer pipe. The reptile made its way to the next opening, dragging the wire to which chains were afterward attached. It was a simple matter then to work the links back and forth and thus remove the obstruction.

CLOTH MADE FROM HEMP BARK

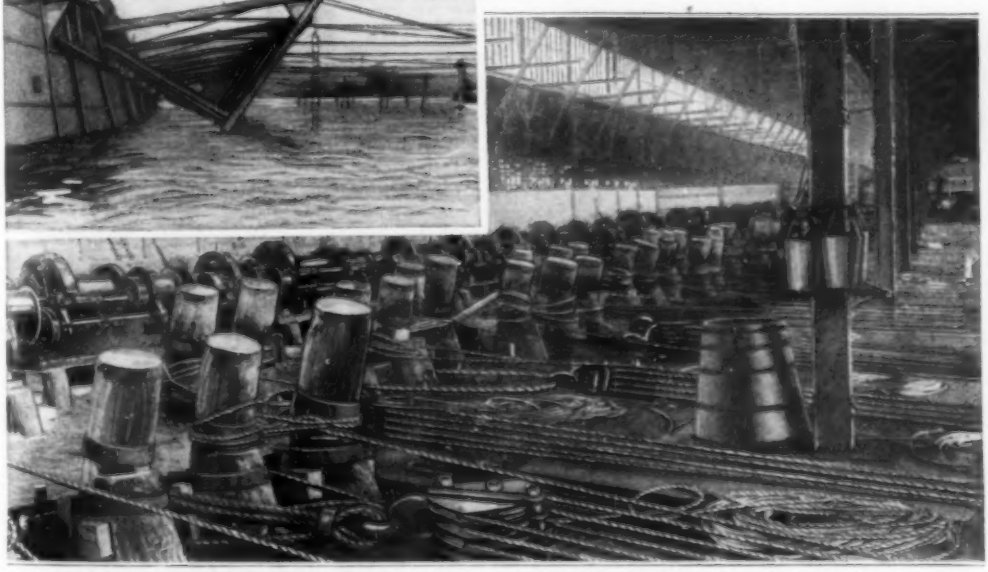
Weaving snow-white fabric from the bark of hemp is becoming an important industry in some sections of China. This cloth, called "hsiapu" by the natives and classified by foreigners as Chinese linen, is excellent in texture and is worn extensively. Compared with the finest silks and satins, the best quality of this grass product is quite expensive.

FRAME BUILT ON HULL TO RIGHT CAPSIZED SHIP



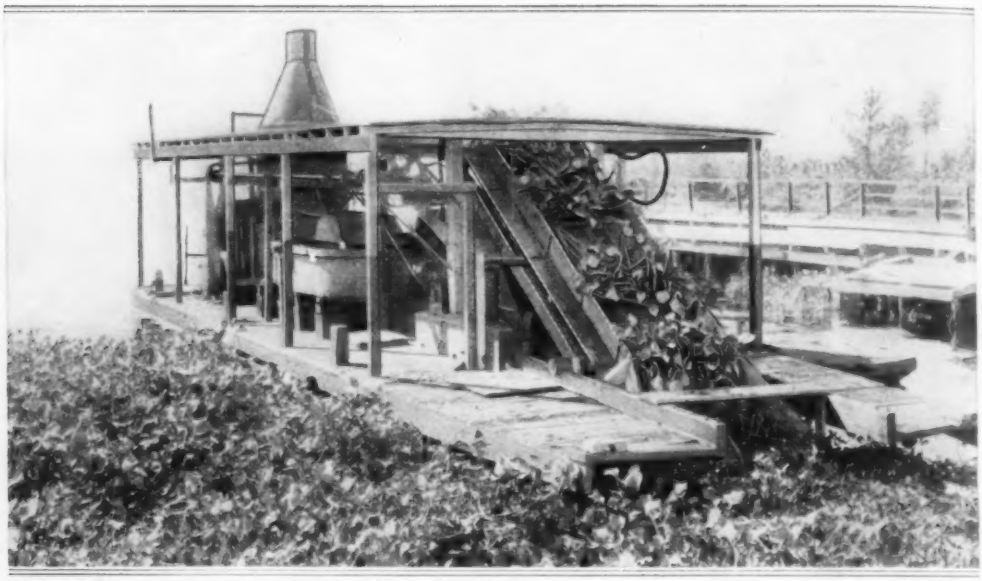
Capsized Ocean Liner That Was Raised and Floated after Cargo Was Removed, Loose Weight Shifted, and Holds Sealed to Prevent Entrance of More Water

To raise a large ocean liner that had toppled over in the harbor of Hamburg, Germany, recently, a heavy framework of steel girders was built on the exposed side of the hull. From the tops of this structure wire cables were carried to a battery of steam winches on shore. All loose objects on board were moved by divers to the shore side of the wreck, and a channel was dug in the floor of the bay close under the steamer's bottom. One hour before high tide the engines of the winches were started, and aided by the rising waters, the great hulk slid into the channel and slowly swung into an upright position. The sticky mud held the craft firmly in the "pocket" until holds and compartments were cleared of water and ballast adjusted. In addition to the engines ashore, four large salvage craft and a floating crane lifted the ship from the outer side. During the raising two cables on the steel beams broke, but did not cause the vessel to drop back.



Twenty Winches and 132 Piles Driven into the Shore Served to Pull the Giant Hulk Upright. Above: Steel Structure on the Side of the Righted Hull

HYACINTHS "EATEN" BY BOAT TURNED INTO PAPER

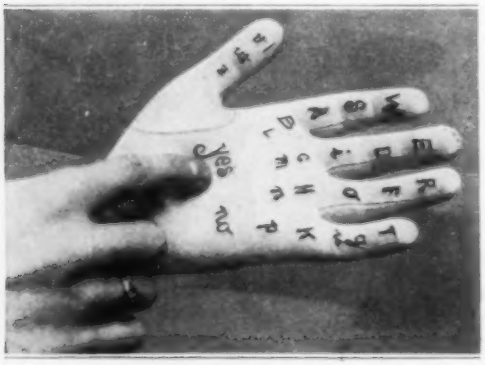


Queer, Self-Propelled Boat that Picks up Water Hyacinths on Rakes Attached to an Endless Chain and Reduces Them to Pulp Used for the Making of Paper

To destroy the water hyacinths that are a menace to navigation in the South, an inventor has designed a boat that not only removes the plants but reduces them to a pulp which is fireproof and may be made into wrapping paper or roofing material. Self-propelled, the ship forces its way into the thickets of the growths, draws the weeds through an intake, chops them up, and produces the fiber product. Operated by only three men, the exterminator consumed 1,440 square yards of its fodder in six hours during a recent test. The plants are scraped from the bottom of the river by rakes attached to a chain conveyor.

"SPEAK GLOVE" ENABLES DEAF AND DUMB TO "TALK"

Deaf and dumb persons in Europe find it easy to converse with those who are not familiar with the sign language by wearing a glove stamped with letters of the alphabet and the words "yes" and "no." Spelling out words by pointing to the characters, a conversation understandable to almost anyone can be carried on without the use of paper and pencil. The vowels and consonants are arranged on the thumb, fingers, and palm after the fashion of an American typewriter keyboard.



Letters in Glove That Enable Deaf and Dumb Persons to Converse without Signs

WATER POWER LIGHTS CITIES FOR FOUR HUNDRED MILES

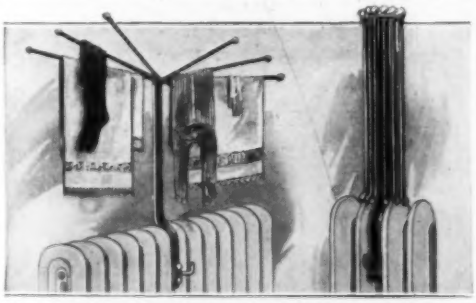
Electricity made by water power in western mountains is being transmitted to cities almost 400 miles distant with little loss, causing engineers to believe that distance is no longer a barrier in transmitting current. Reservoirs will be built so water can be stored in flood season and released during droughts, they predict. A high-pressure, two-circuit transmission line, carrying 220,000 volts a long distance in the West, has been completed recently.

SECOND-STORY SIDEWALK MAY AID CHICAGO'S CROWDS

Elevated sidewalks in Chicago's downtown district are urged to relieve the ever-growing traffic congestion. Under the arrangement proposed, the roadway below would be given over entirely to vehicles and the parking of automobiles. It is pointed out that this step might create a system that would take care of all future problems, as the separation of pedestrians and vehicles would greatly increase the capacity of the ground level. The plan also includes passengerways in alleys, which would give buildings much more advertising show-window frontage and leave the lower passageway free for trucking. By means of viaducts, heavy and light traffic already have been segregated in two streets that border the business section.

CLOTHES DRIER ON RADIATOR TO SAVE SPACE IN HOME

To hasten the drying of clothes after washing, a rack is being made that may be fastened to any-size radiator. Its several



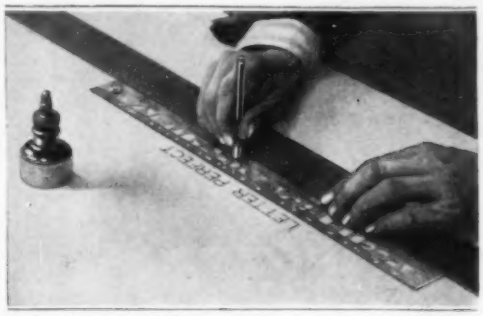
Clothes Drier that Fastens to Radiator; when not Needed It Can Be Folded Up for Storage

arms extend outward in fan shape. When the radiator is warm, circulation of the air insures a draft of heat passing over the materials. Moisture is carried off in a few minutes. The hanger eliminates the necessity of stringing a line in a room, thus saving space in crowded homes and small apartments. A rustproof coating on the rods prevents them from spotting the fabrics. The drier can be attached or removed by simply turning a screw, and may be folded up and stored away when not needed.

¶For the manufacture of baseball bats, a wood new to the industry is being imported from Cuba.

GUIDE FOR LETTERING PEN GIVES SKILL TO NOVICE

To insure neatness and uniformity, a letter guide has been devised with which, it is said, skilled persons and amateurs can



Aided by this Guide Amateur Letterers as Well as Skilled Craftsmen Produce Artistic Signs

mark maps, drawings, charts, and price cards equally well. Grooved on the under side, the instrument can be moved from one character to another without smearing the ink. While in use, a shift button that releases at a slight downward pressure, holds the device securely to the work. Some of the letters can be formed by a single stroke. Openings are cut in the transparent sheeting by means of which a specially designed pen is steered in forming the symbols and numerals.

TICKLESS WATCH MINUS HANDS TAKES TIME FROM SUN

Hands or gears are not required by a timepiece that takes its readings from the sun's position in the sky. The instrument will work anywhere within the confines of the United States, as it is adjusted for these latitudes. A sundial and a compass combine to indicate the correct hours of the day between 5 o'clock in the morning and 7 o'clock at night. The device can be carried in the vest pocket and possesses an accuracy that rivals many larger and much more complicated timekeepers.

Far from the Propeller-Churned Lanes of the Ocean Liners, Sailors Believe There Exists a Mass of Seaweed in Which Ships of Many Ages Are Imprisoned

Superstitions of Sea Defy Age of Reason

Sailors Still Firm in Belief in "Flying Dutchman" and the "Port of Missing Ships"

CLINGING to old beliefs in portents of good and bad luck, the sailors aboard the steamer "West Campgaw" recently attributed a hard battle with Atlantic storms to two young clergymen who were working their way to Europe as cattle men aboard the ship.

Both of the offending clerics, according to newspaper dispatches, were warned that singing hymns was just tempting the devils of the deep, but they persisted, and the result, the sailors said, was 48 hours of terrific battling against gales and fog in the region infested with icebergs.

Nevertheless, the chronicles of Davy Jones show that the preachers were fortunate in selecting the twentieth instead of the fourteenth century for their nautical adventure. In the early Middle Ages, the black robe of a churchman was regarded as an unfailing assurance of ill luck for the craft he sailed on. When subsequent behavior on the part of the winds and waves justified belief in the augury, the inoffensive offender was occasionally even thrown overboard.

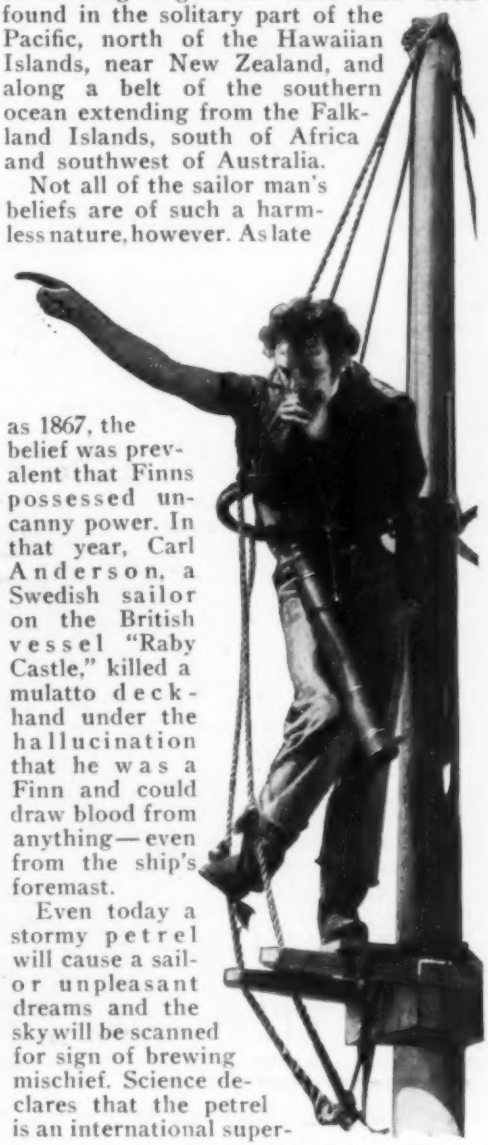
"Superstitious as a sailor," is a phrase proverbial in the language of every country bordering on any of the seven seas. And while steel ships, radio, the Diesel engine, and scientific investigations have done much to eliminate beliefs which the forefathers of today's salt-water hearties held to the last man, stories of the "Flying Dutchman" and the Sargasso Sea are still to be heard wherever sailors gather.

Many a lookout will swear that in the still watches of the night he has actually beheld a great galleon, with all sails set and its crew, clad in medieval costumes, grouped about its decks, drift like a specter across the bows of some modern liner and then fade into the mist so close that even the musical chime of its ship's bell could be plainly heard across the waters. Others swear that they have beheld the "Port of Missing Ships," in the Sargasso Sea, where, it is believed, the vessels of many ages have become embedded in seaweed and drift in an endless circle far from the propeller-churned track of the liners.

So strong was the latter belief that an expedition was fitted out by Sir John Murray and the Norwegian government in 1910, which found the surface of the sea at the spot mentioned in the legends covered with patches of weeds, which, however, were not continuous, and could not have held any ship captive. Because of the vagaries of ocean currents, such masses of drifting vegetation have also been found in the solitary part of the Pacific, north of the Hawaiian Islands, near New Zealand, and along a belt of the southern ocean extending from the Falkland Islands, south of Africa and southwest of Australia.

Not all of the sailor man's beliefs are of such a harmless nature, however. As late as 1867, the belief was prevalent that Finns possessed uncanny power. In that year, Carl Anderson, a Swedish sailor on the British vessel "Raby Castle," killed a mulatto deckhand under the hallucination that he was a Finn and could draw blood from anything—even from the ship's foremast.

Even today a stormy petrel will cause a sailor unpleasant dreams and the sky will be scanned for sign of brewing mischief. Science declares that the petrel is an international super-



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Two of Nine United States Destroyers Wrecked During a Fog on the California Coast in the Greatest Peace-Time Disaster in the History of the American Navy

stition rather than a sound weather sign, but the sailor knows better, he declares. And he seldom can be argued out of his conviction that a school of dolphins or porpoises playing is an omen for the weatherwise. Their sport also means dirty weather.

In the olden days, credulity often rose from a lack of scientific knowledge and training. Columbus' journal tells of seeing mermaids, but these, present-day knowledge asserts, were merely sea cows. Sailors still believe that sharks follow a ship on which a death is to occur. Their somewhat gruesome faith in the unerring instinct of the finny monster has no traceable beginning, but is deeply rooted in the minds of nautical folk.

For many years the Scandinavians have held a reputation for hardihood at sea, but two years ago a liner from the north came into New York harbor with most of the crew wearing close-cropped hair. The captain admitted that during a two-days' howling tempest, the ship had literally lost way, rather than gained on its course, until the crew called to mind an old belief and insisted on hair-cutting—and the tempest died down before the barbering was completed.

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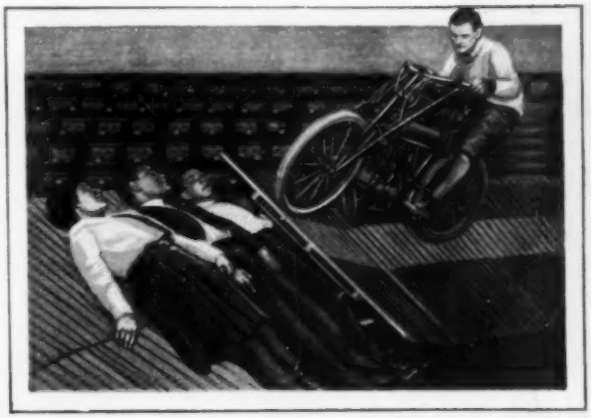
The "Charles W. Morgan," Said to Be the Oldest Square-Rigger Afloat

Evidence of another strange superstition is to be found on ships crossing the equator in the weird services conducted to initiate passengers and members of the crews into the kingdom of Neptune. Then there still exists, despite the evidence of science, a belief in the existence of mermaids and sea serpents. The latter is attributed mainly to the antics of schools of dolphins that, seen at a distance as they leap from the waves, have the appearance of some great serpent writhing its way through the water in the sunshine.

MOTORCYCLE ON SPEED TRACK LEAPS HUMAN HURDLE

Whirling around a saucer-shaped track, a motorcyclist giving exhibition performances in Germany jumps his machine over a human hurdle. Three people lie side by side across the path of the racing cycle, which is thrown into the leap by the turned-up end of the platform. Passing over the gap it lands on the flat continuation of the course at full speed. The track is a portable one of wood, built in sections.



Motorcyclist about to Take the Leap over a Human Hurdle While Traveling at Full Speed

ELECTRIC ENGINE BURNS ASHES FOR ITS MOTIVE POWER

Generating its own motive power by burning ashes from locomotive fire boxes, an electric railway engine is being experimented with in South Africa, which eliminates the need of central power stations, overhead charged wires, or "third" rails. Engineers believe that its perfection will result in great changes in suburban and branch-line transportation because of its cheapness of operation. In a recent test run, a 30-ton car was driven at a speed approaching 20 miles an hour by energy manufactured by its refuse-burning plant. Electricity is created by heating the cinders and extracting a gas, which, after passing through a purifier, runs two internal-combustion engines operating a dynamo. It is estimated that a locomotive equipped with this system can travel 150 miles on five or six bags of cinders and 10 gallons of water.

THREE-IN-ONE LADDER AVOIDS ACCIDENTS, SAVES TIME

Folding in the center, a ladder is being made than can be used either in straight or step position, and as a trestle. Extended or folded, the two sections are securely fastened in place by automatic locks on each side of the frame. As a stepladder, it is prevented from collapsing by a stout safety chain and will support two persons, one on each side. It has a wide base and there is no side sway.

Ladder for Use in Either Straight or Step Position, or as a Trestle

WINGED TORPEDO TO BE ADDED TO U. S. COAST DEFENSE

Although the tests have been shrouded in secrecy, it has become known that army and navy experts have been developing a winged death-dealer—an air torpedo that runs under its own power. Its stopping point can be accurately fixed, it is said, and its explosion timed. The device will not operate by radio control, though experiments have been made along that line. Use of the wireless was discarded, as it was feared that a torpedo so controlled, would also be sensitive to influences coming from other directions and might become a "boomerang" by being turned back upon its operators.

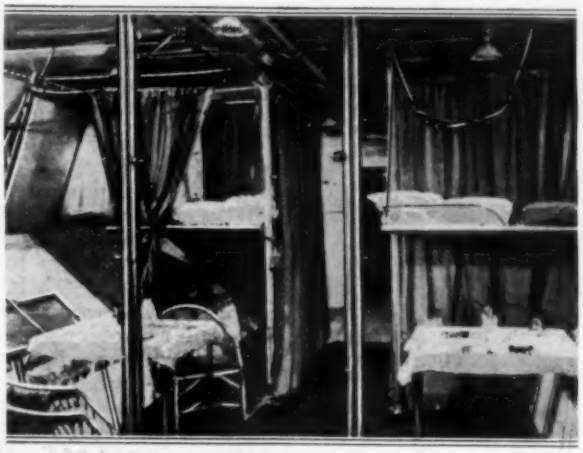
Prophetic of a Near Future when Huge Airships Will Be as Common as Trains and Steamships Today, the ZR-1 Glides Serenely Above Busy Thoroughfares of American Cities

LIGHTED AIRWAY OVER ATLANTIC IS PREDICTED

AS though painting the future, Paul Henderson, assistant postmaster-general, who conceived the idea of transcontinental air-mail service, sees a lighted airway over the Atlantic Ocean, along which will fly great, winged ships carrying mail between American ports and European cities.

This prediction was made following the flights of the United States Navy's giant dirigible, ZR-1, one of which took it halfway across the country and back to its station at Lakehurst, N. J.

The ZR-3, another big lighter-than-air ship, now being built for this government in Germany, is said to be larger and faster than the ZR-1. When completed it will be put into transatlantic service carrying mail between New York and London, according to government officials.



Interior of One of the Cabins that Provide Comfort for Passengers and Crews on Air Liners

The plan for the illumined path across the seas includes a series of anchored docks, one every 400 miles, similar to landing fields. Aided by these, the airplane types of carrier can be utilized. The trip, one way, is not expected to take more than two days. The floats would be secured with heavy anchor chains and rest on steel pontoons, elevated sufficiently above the water to avoid the highest waves.

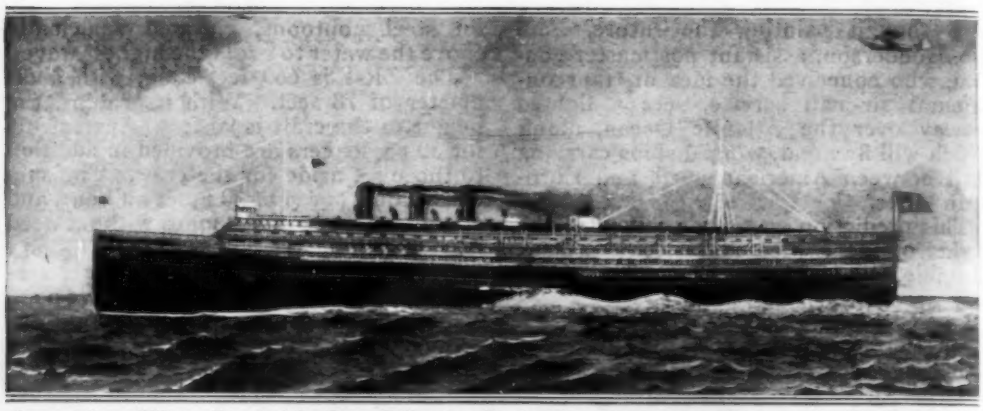
The ZR-1 is 660 feet long, with a diameter of 78 feet. With its cabins, the height of the craft is 96 feet. Apartments for 30 passengers are provided in addition to those set aside for the crew. The ship can attain a speed of 70 miles an hour, and cover a distance of 400 miles without need of stop or landing.

For fuel, gasoline is used. The reservoirs have a capacity of 8,000 gallons. The great cigar-shaped cylinder incloses 20 bags filled with helium, a noninflammable gas.

With the introduction of the ZR-3 into the cross-seas service, the Pacific and Atlantic oceans can be brought into close touch with each other by air. Instead of the weeks that are sometimes now necessary to transport mail matter from Europe to the western-coast cities, a period of but a few days will be required to make the trip by air-mail ship. It is believed that a regular 28-hour cross-country schedule will be installed in the air-mail service from New York, which, with two days needed for the ocean journey, will reduce the fastest time now being made.

After Europe and America Have Been Linked by Air Routes, Attention Will Be Turned to Establishing Aerial Lanes Across the Pacific to China and Japan

LEVIATHAN OF INLAND WATERS LAUNCHED

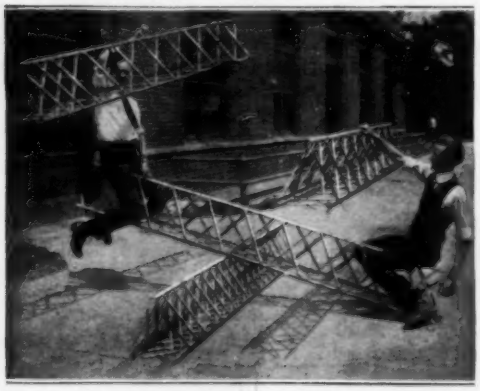


Largest Inland Water Vessel of Its Type, Believed to Be the First Big Passenger Steamer that Has Been Built for Great-Lakes Traffic Since the Great War

Launching of a leviathan of the Great Lakes, said to be the largest passenger steamship in the world for use on inland waters, took place recently at a lake port. It is the first big boat of its kind to be built for such service since 1917. Measuring nearly 550 feet from stem to stern and 100 feet amidships, it will have accommodations for about 1,200 passengers and a crew of 300 men. After the christening ceremonies, the hull was towed to another point where the superstructure and the interior decorations will be finished. Its total cost is expected to reach more than $3,500,000. Although lake craft is gradually assuming the lines of ocean steamers, many of the older types of construction are still employed by the builders.

AIRSHIP METAL LIKE WILLOW, YET STRONG AS STEEL

Duralumin, an alloy of aluminum, which is used for airship girders, according to recently completed government tests is as strong as the best steel, yet only one-third as heavy. Weighing but 150 pounds



Test Showing Strength of Metal Used in Building Girders for Giant Airships

a cubic foot, as compared with 450 pounds for the same amount of structural steel, this metal can resist a stress of 27½ tons, proving it to be one of the toughest known. A support of this material, 16 feet long, such as were used in the framework of the giant dirigible, ZR-1, tips the scales at 5⅓ pounds, yet, in the shape of a column, will hold a load many times its own weight. A piece the same size fashioned as a beam will sustain 125 pounds for each foot when the burden is evenly distributed. When first rolled, this product is very soft. After being heated to a temperature ranging from 897 to 914 degrees and immersed in water or oil, it increases in strength. As it cools, and is allowed to stand, it gains in toughness until at the end of a week it is said to be as strong as the highest grade of steel.

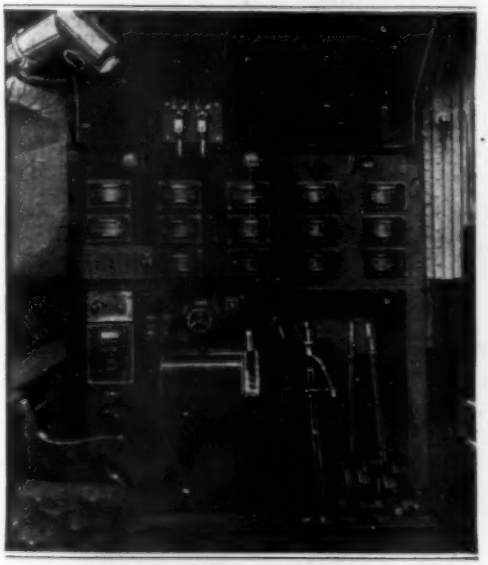
TWO-DOLLAR NOTE IS DOOMED; VICTIM OF SUPERSTITION

Because of its unpopularity and the superstition attached to it, the two-dollar bill is said to be fast passing from circulation. Government officials admit this prejudice is general among all classes of people throughout the United States, except in New England, and even now are considering the advisability of discontinuing it. It has been omitted from the new designs for United States bank notes. The

speed with which it circulates and becomes unfit for use is seen as an indication of its disfavor. Its life is less than six months, the shortest span of existence accorded to any form of paper currency. When it goes to the treasury for redemption, it is dirty, soiled, and unkempt. Frequently one corner is torn off. The bad-luck superstition which is responsible for much of the mutilation of these bills seems to be prevalent among those who risk their money in games of chance. Tearing off a corner is supposed to remove the "jinx." Even then the holder exchanges it as soon as possible or gets rid of it in some other manner.

ELECTRIC FERRY, LIKE TROLLEY CAR, RUN BY "MOTORMAN"

Propelled by electricity, a ferryboat that has all of its machinery controlled from a switchboard panel has recently been put into operation in an eastern city. An engineer who acts as "motorman" manipulates all driving apparatus from this point under directions from the pilot above deck. In tests held to determine the time required to start and halt the craft, it was brought from full speed to a dead stop in 40 seconds.



Control Panel of Electric Ferry from which All Propelling Machinery Is Manipulated by "Motorman"

¶ Mexico is reported to rank first in mineral wealth among the nations of the world equal to it in area.

PENCIL'S WEIGHT BENDS STEEL BAR, DETECTOR FINDS

Even a strong steel bar bends under a very slight weight, according to a test recently made by government experts using an "interferometer." By this delicate instrument it was determined that a solid rod 3½ inches in diameter and 2 feet long, was pressed out of a straight line by laying an ordinary pencil on it. Although the depression was ever so small, this sensitive device detected the curve.

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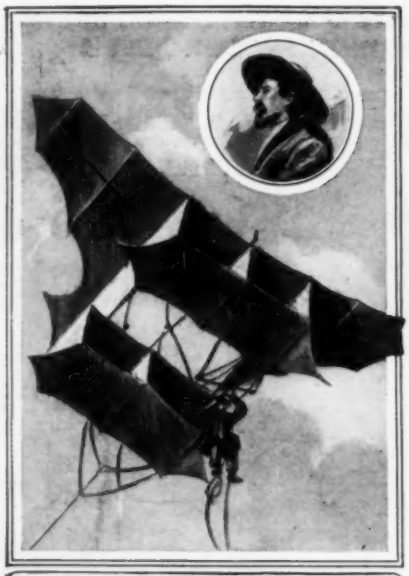
Proving that Weight of a Pencil Would Bend Steel Over Three Inches Thick

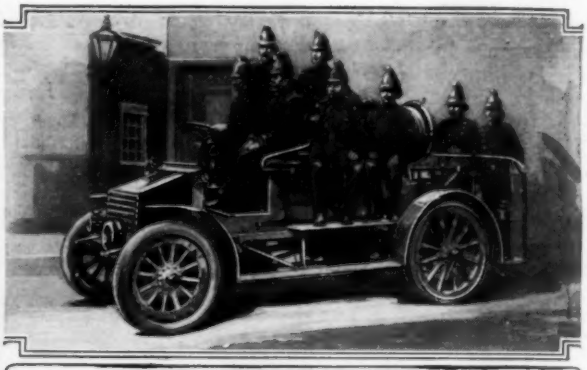
RABBITS HERDED LIKE CATTLE ARE SLAUGHTERED IN PENS

Hunters in Kansas killed 4,000,000 jackrabbits in the past year, according to estimates of state officials, in an attempt to free fields and orchards of these destructive pests. To encourage the warfare against them, the state pays a bounty of 10 cents a head. During the late fall and winter, thousands of them are slain in drives covering many miles. The rabbits are driven by men and boys, aided by dogs, into wire inclosures, where they are slaughtered. The usual practice is to remove the ears with which to collect the reward, and the carcasses are shipped to the larger cities and sold. Sometimes the fur is used for making hats and felt cloth. It is figured the average rabbit causes damage exceeding $1 every year by girdling trees, and cutting roots of alfalfa, corn, and sugar cane.

Twenty Years Ago This Month as Seen



Kite That Crossed English Channel



London Fire Brigade in 1903

TWENTY years ago!

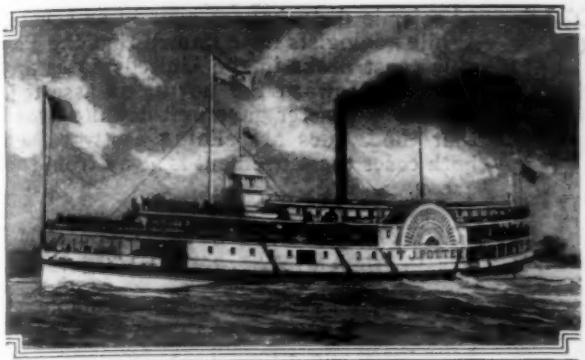
Consider the world in 1903. It had few of the facilities for speed of transport and communication, for rapid quantity production, for convenience and comfort, that today are accepted as indispensable.

Automobiles were just appearing on city streets, the airplane was an object only of derision and jest, wireless telephony was scarcely more than a dream, and moving pictures had hardly emerged from the museums where they were first exhibited.

And yet, all of these things now seem commonplace. They are wonderful only when an image is formed of a world without them

Opening of the Assuan Dam, and One of the First Railway Coaches Designed to Be Propelled by a Gasoline Motor

in the Columns of Popular Mechanics



River Steamboat of Two Decades Ago

Early Type of Fire Extinguisher Operated by Electric Motor

Nevertheless, the achievements of the past serve as the best guide to the future, according to Charles P. Steinmetz, one of the world's greatest engineers.

"What will our children's children think of the helpless human race in the year 1923?" he said recently. "I have no doubt that the transformation to be visualized a hundred years from now will be more complete than the most fanciful among us might conjecture.

"Electric power," he asserted, "will be at the service of everyone for every need. It will be as common as water is at present and distributed in much the same manner."

Trackless Trolley That Preceded the Motor Bus, and Sand Dial Attached to Phone to Measure Time

TYPEWRITER PAGES IN ROLLS SAVE TIME IN CHANGING

Paper, in rolls or in continuous lengths, fan-folded in a box, is automatically fed into a typewriter or billing machine, recently invented, to save time formerly spent in placing and withdrawing sheets. As many as 1,000 pages can be written without renewing the paper supply. For making copies, the work is further speeded up by use of long carbons held by metal fingers at the back of the machine. Separating of copies is done by a slitter, set in a rigid position and requiring no attention from the writer.

Machine on Which Person Can Write 1,000 Pages without Inserting a New Sheet

EARTH'S INNER TURMOIL MOVES HIGH PEAKS OF SURFACE

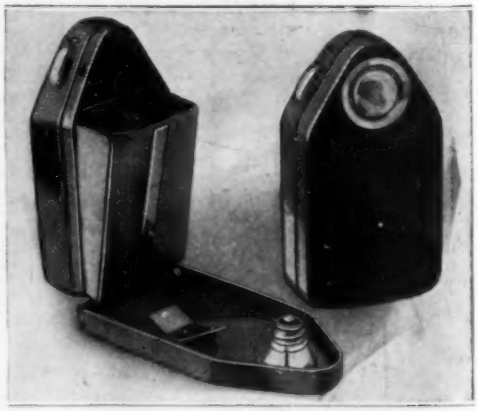
California coast ranges are being forced northward and the Andes Mountains of South America are moving slowly eastward, in the opinion of a scientist studying the effects of the turmoil going on within the earth. The eastern part of Japan, he says, is being pushed westward. These changes, he believes, are results of tremendous pressure exerted from beneath the "Pacific deep." Both the recent Chilean earthquake and the Japanese catastrophe, according to him, were due to the progress of these shiftings and are the forerunners of seismic disturbances equally as severe. While geologists have known that the Pacific coast peaks in the United States are marching toward the north, he asserted, the Chile disaster gave first definite proof that the Andes are sliding eastward. In both cases the movement is away from the ocean.

GREYHOUND IS SPEED DEMON OF ANIMAL KINGDOM

Through a series of recently completed tests, the speediest animals are reported to have been determined as follows: the greyhound, race horse, prong-horned antelope, hare, Texas jackrabbit, common fox, coyote, foxhound, and gray wolf. The records were made by noting the number of bounds made by each animal in a given space of time, by means of a stop watch, and then measuring the length of the leap. The greyhound, it was ascertained, can travel a short distance at 35 miles an hour, about four miles an hour faster than the hare. None of those studied, however, can keep up their speed for any considerable distance, although the fox and wolf can beat either the greyhound or race horse in this respect.

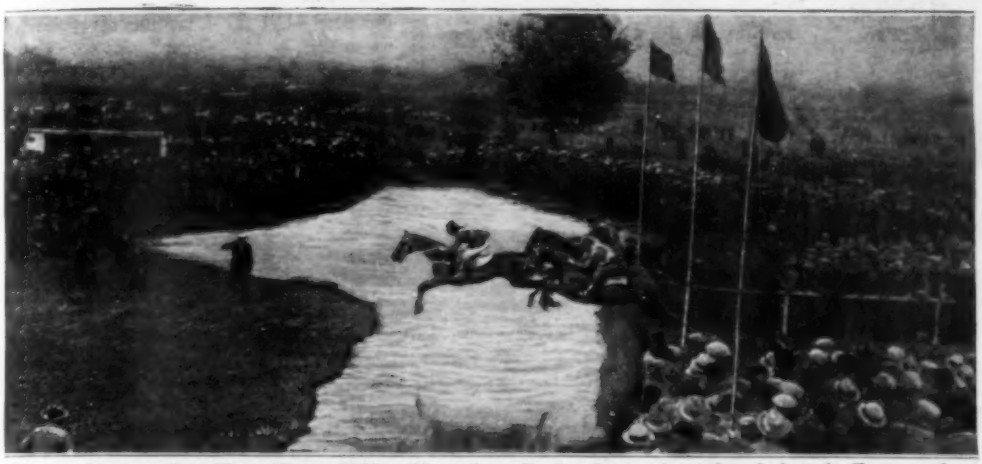
WATER POURED IN FLASHLIGHT STARTS BATTERY ACTION

So the battery in a recently invented pocket flashlight will not deteriorate on a store shelf before being used, water to start the chemical action is not added until it is to be placed in service. The case is of a convenient shape that can be placed on end, while the bulb on the side gives a strong, white light.



Flashlight with Battery That Becomes Active When Saturated with Necessary Amount of Water

HORSES LEAP RIVER FORMING BARRIER IN RACE



Notable Photograph of Three Horses Taking Water Leap During International Steeplechase in Europe, where a Single Misstep Meant Disaster and Loss of the Race

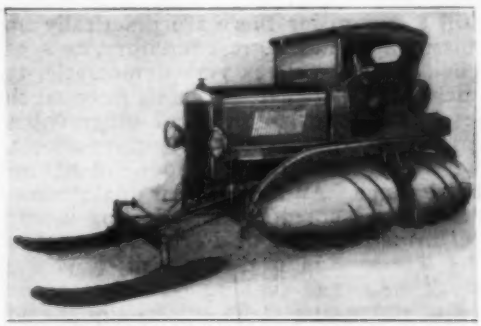
Taxing the skill of their horses, jockeys at an international steeplechase held in Europe recently, jumped them over a hedge and across a river, said to be the longest water leap on any course in the world. Usually in such an event, if the horse falls, he is either injured or does not finish because of the delay. In the contest, two horses left the ground, nose and nose, and passed over the water together. To the watchers they did not vary a fraction of an inch in the entire movement.

RADIO RECEIVER HELD ON EAR WITHOUT HEAD BRIDLES

Fitting over the ear, a radio receiver is being made in Europe that does away with head bridles. It allows greater freedom of movement, yet is not uncomfortable, since its light weight is evenly distributed. As the ear is entirely inclosed in the device, with a cushion of air between it and the diaphragm, external noises are shut out, music and voices sound more natural, and the wearer can hear more distinctly. Sets of two are also being turned out.

AUTO WITH "WHEELS" LIKE EGGS PULLS LOADS OVER SNOW

For traveling over snow and ice, a motor-driven vehicle resembling an automobile has been made that has four revolving egg-shaped drums that grip the roadway with sets of spiral flanges. By rotating the two pairs of "wheels" at the sides in opposite directions, the car is prevented from slipping from its course. Steering is accomplished by means of bobsled runners extending in front. While its speed depends on the design and conditions under which it operates, it has been run through deep snow at the rate of seven miles an hour, and over flat, icy surfaces is said to have made 23 miles in the same time. Primarily intended for winter service in logging and mining camps, it is also suited to other industries. During tests in a lumber tract the machine handled larger loads than teams could manage, and in one case started and moved four sleds of logs totaling in weight over 80 tons. In unpacked snow it does not sink more than eight inches and leaves furrows that can be used by following horse-drawn vehicles.



Courtesy Engineering & Mining Journal

Egg-Shaped "Wheels" on Tractor for Use over Snow or Ice

Wild Man of Borneo as He Is Today

Head Hunters Brave, Industrious, and Thrifty on Their Island Home

By FRANK BURNETT

IN Borneo the Sea Dyak best represents the "wild man" most persons have heard about, but few have seen, for the exhibit of the circus is not always a genuine savage of the Bornean wilderness.

Though a confirmed head hunter, the Sea Dyak is still a most genial character, and a good citizen, aside from his head-hunting habit. How this can be is, of course, entirely due to the different points of view prevailing upon certain matters in various parts of the world.

On his island home the Dyak is brave, not cruel, and never tortures his prisoners. He is kind and affectionate to his family, energetic, industrious, thrifty, exceedingly honest, and very hospitable. Though still a pagan, for there are practically no missionaries in his great territory, he is of good morals. He is very democratic, to such an extent that the chiefs have much less influence than those of other tribes in Borneo. Unlike so many native people, he is not vindictive and does not harbor a grievance. An idea of their quaint viewpoint is presented in the following story:

During my stay at Fort Kapit, far in the interior, on a recent visit, a young Dyak chief one evening walked into the living room where the commissioner and I were seated. He helped himself to tobacco, then sat down and talked for some time. When he finally left, I asked the commissioner what he wanted. "Oh, nothing very much," the commissioner replied with a smile; "he was merely interested in knowing how the work was proceeding in which he had been engaged in helping the government, a few months previously, some distance down the river. That is his quaint way of describing his term of imprisonment for what you would call murder in a civilized land, but which he considers a quite laudable action—depriving a Chinaman of his head."

Naturally, in such a land the taking of a head is not so severely punished as in civilized regions. To take certain human heads is part of the Dyak's way of life. That this is the correct thing is impressed upon him from earliest youth. Furthermore, no young man can get a wife until he has taken at least one head. "The more heads, the more influence," is the way of life among the Dyaks.

Stores of heads have always been the principal feature at Dyak feasts. Each chief would orate at great length over various heads selected from his pile, thus showing what a mighty warrior he was to have killed so many. He would also point out certain heads as belonging to famous men of enemy tribes. Due to the white government's campaign against head hunting, carried on vigorously for many years now, the number of heads taken has so greatly diminished that young chiefs are lacking in stock in trade.

To relieve the situation, and as the best means of keeping in check such outbreaks of killing, the white men ruling the land have adopted the plan of lending surrepti-

Sea Dyak in War Dress Made of Tiger-Cat Skin, and, at Right, a Human Head Recently Taken, Together with Other Ornaments

Native Village in the Wilds of Borneo Peopled by Famous "Wild Men" and Head Hunters

Rock Temple, Priest House, and Bath that Bear Testimony to the Industry and Skill of the Sea Dyaks in Borneo

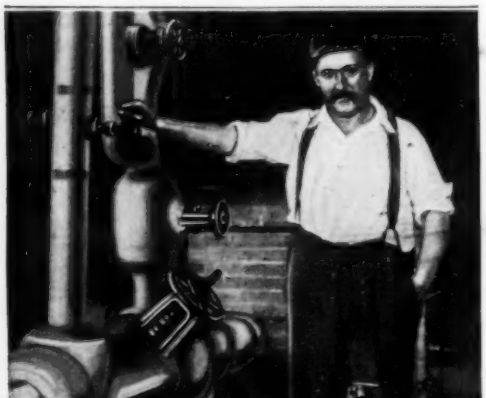
tiously to various chiefs collections of heads now in the government's possession. As all heads look very much alike, once the flesh is gone, the chief can still pick out any one without fear of detection and ascribe it to So-and-So, famous chief of another tribe. In this way the government helps the natives save their face without breaking the white man's law.

The Dyak war dress is made of tiger-cat skin decorated with the feathers of the rhinoceros hornbill. From morning until night both men and women indulge in betel nut. As the Dyak women do as much paddling as the men, they have these implements made of wood of a size to fit their strength and decorated with bone. The Dyaks are a musical race, and fond of dancing. The principal musical instrument is a compound of reeds fitted into a gourd bowl. When a number are played at once, a Scotchman listening might believe himself back at home, so like is the sound to that made by bagpipes.

This, very briefly, gives an idea of the Sea Dyak who, today in a century when civilization has reached a completeness never reached in any previous age, still lives primitively and fully deserves the name of "wild man of Borneo."

COAL YIELDS SMOKELESS FUEL, GASOLINE, AND CHEMICALS

Smokeless fuel, gasoline, and several chemicals have been obtained from soft coal by a distillation process recently in-



Valves Used in Distillation Process to Obtain Valuable By-Products from Coal

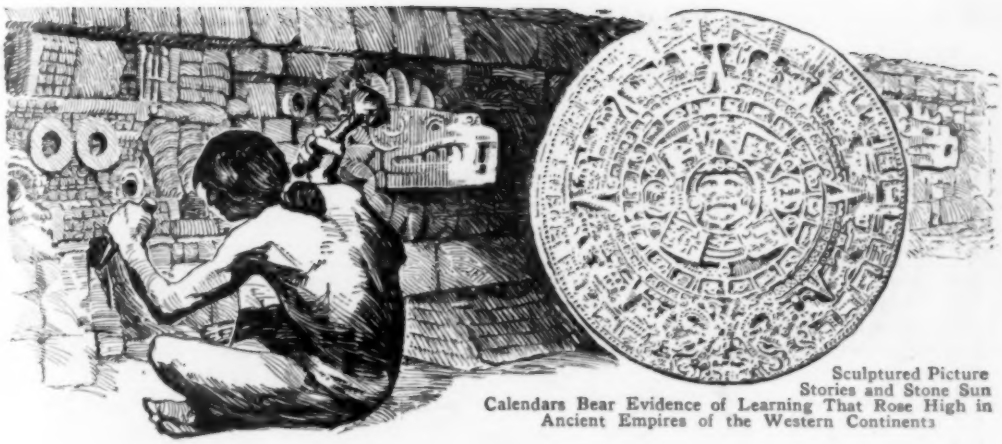
vented by a western engineer. While these substances are loosed from a single ton of coal, there remains 1,480 pounds of the original 2,000 that still possess high heating value. Although this residue, because it is free from smoke, may give the discovery its greatest fame, the possibility of extracting by-products—oils, greases, and bases for dyes—is said to be attracting industrial interest. In the process, domestic-size coal is poured into a retort, where superheated steam is forced through it. As this rises, it takes with it many different elements, which now are said to escape in smoke. From the top of the furnace, the vapor goes into a pipe, and thence travels into the first of a series of separators. The tests showed that almost 20 gallons of gasoline can be extracted from each ton of coal.

IRON WEIGHT CAN'T BREAK GLASS FOR GOGGLES

To increase the safety of goggles, lenses stronger than any heretofore made have been developed by a large optical factory. The glass, while sufficiently clear to give the wearer unimpaired vision, is said to be tough enough to withstand the impact of a steel ball 1⅜ inches in diameter dropped from a height of eight feet. Preceding types, it is said, failed to sustain blows of much lighter force. Because of the greatly improved efficiency of this product, it is said to offer the best protection for workers who are exposed to flying chips.

METAL FISH WITH A RUDDER MADE TO THRILL ANGLER

To provide the thrills of angling without tiresome waiting, a metal fish has been devised, shaped, and painted to resemble a real one. The line is attached to the top side of the device, so that it will glide from one side to another as it is pulled through the water. A straight or angular rudder also can be fitted to the tail, if desired. By extending the cord through the hole at the base of the eyelet and affixing barb and bait, a small design can be used to attract fish, since a slight movement of the pole will cause the lure to jump up and down and wiggle sideways.



Sculptured Picture Stories and Stone Sun Calendars Bear Evidence of Learning That Rose High in Ancient Empires of the Western Continents

Secrets of Long-Lost Races Sought in Ruins of Once Mighty Empires

SEEKING the lost knowledge of the world's yesterdays, passed away with long-forgotten races, a dozen scientific expeditions are penetrating to the very outposts of civilization. Excavations that would swallow a city block have revealed the remains of ancient kingdoms that perished long before history began.

On the island of Ceylon, the skyscraper city of Anuradhapura, that flourished more than 2,000 years ago, has been uncovered by some of these explorers. A French engineer sounding the waters off Alexandria, Egypt, claims to have discovered an undersea construction that may prove to be an ancient harbor works built by the Pharaohs. Asiatic diggings promise still greater revelations.

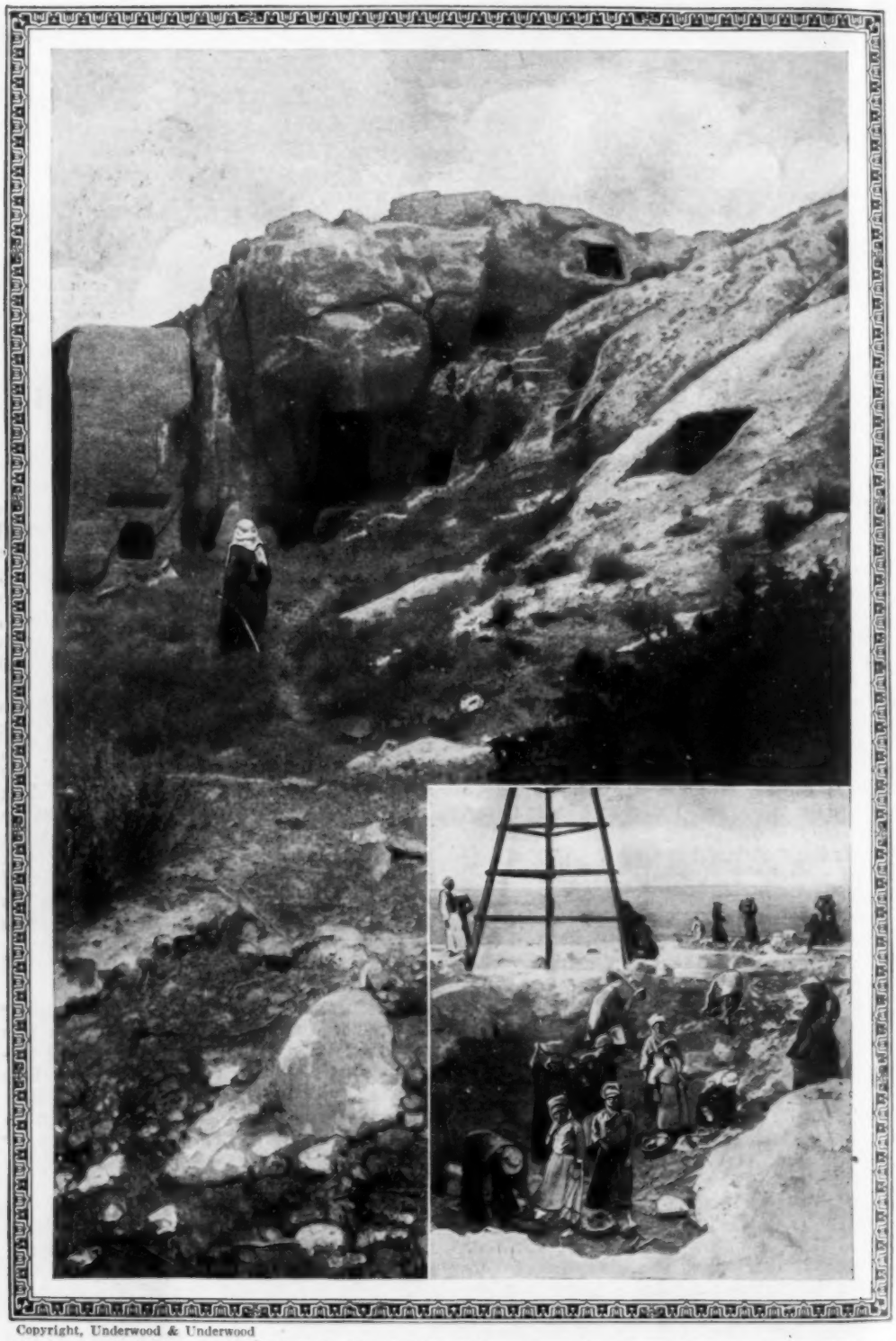
Recently Ur, in Upper Egypt, gave up what is said to be the oldest temple yet found by modern civilization. Out of this city, Abraham, of the Bible, a highly civilized man, is said to have come. The deadly jungles of South America, the swamps of Patagonia, where is rumored to live a giant monster of the early ages, the sunburned wastes of Central America, once traversed by learned red men, all claim the efforts to solve the riddles of ancient existence.

Excavators, working in the Valley of Mexico, report that five different civilizations succeeded each other there. The oldest is believed to have flourished on plains 40 feet below the present surface. A race that rivaled the peoples of old Rome is claimed to have lived farther south. The zenith of their culture is placed between 300 and 600 A. D. With them, when they passed away, went secrets of their vast treasure vaults and the sources of the almost eternal dyes of beautiful tapestries now seen hanging in museums thousands of years after they were made.

In villages bordering the wild and untrammeled forests of South America, strangers alien to the soil are often seen circulating among the superstitious chicle gatherers when they return from the fastnesses. They are the scouts of expeditions, alert for any yarn or rumor that might betray the location of ancient relics.

It was in such a section that the great sacred well of Chichen Itza was found in Yucatan. Victims once were dragged to it over a paved pathway, and cast alive with all their goods into its waters to drown as a tribute to fierce tribal gods. Most of the relics have been removed from its dreaded depths. In Palestine, two stone tablets have been dug up which authorities say furnish proof of the captivity of the Jews in Egypt.

Dark caverns, yawning pits, towering mounds, and bottomless morasses in the abandoned places of the world are all objects of the explorer's endless labors. But inspired by superstitious fear of their barbaric religions, the older peoples seem to have left little in view for the stranger of the future. Temples were ruthlessly destroyed, cities burned, and captives silenced, in attempts to guard their domains against the trespassing outsider. Precious metals worked into gorgeous designs, jewels, rare woods, and paintings that defy the expert eye of the modern chemist, all exist to tell of their creators, but none seem to reveal the secrets of the crafts that made them.



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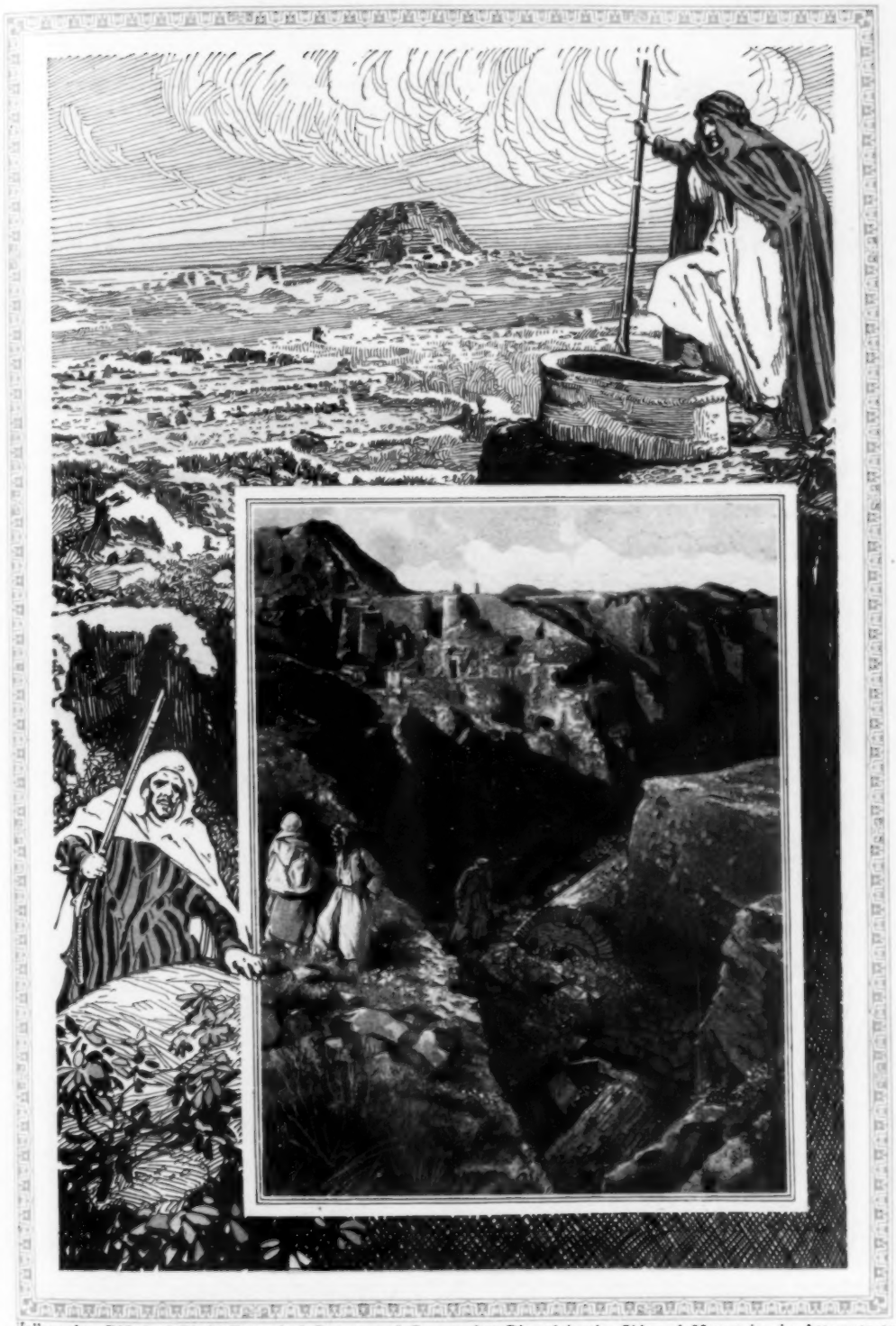
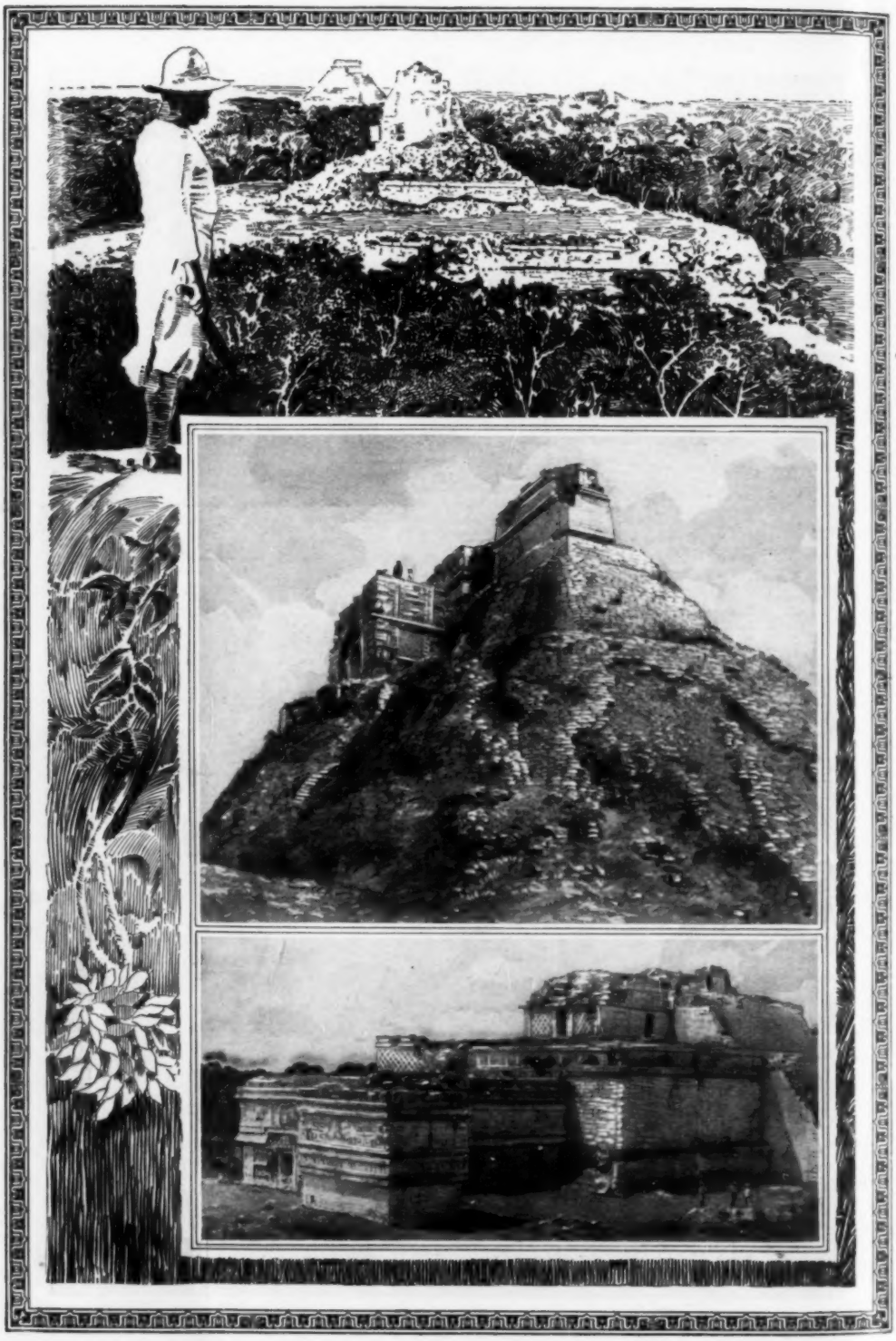
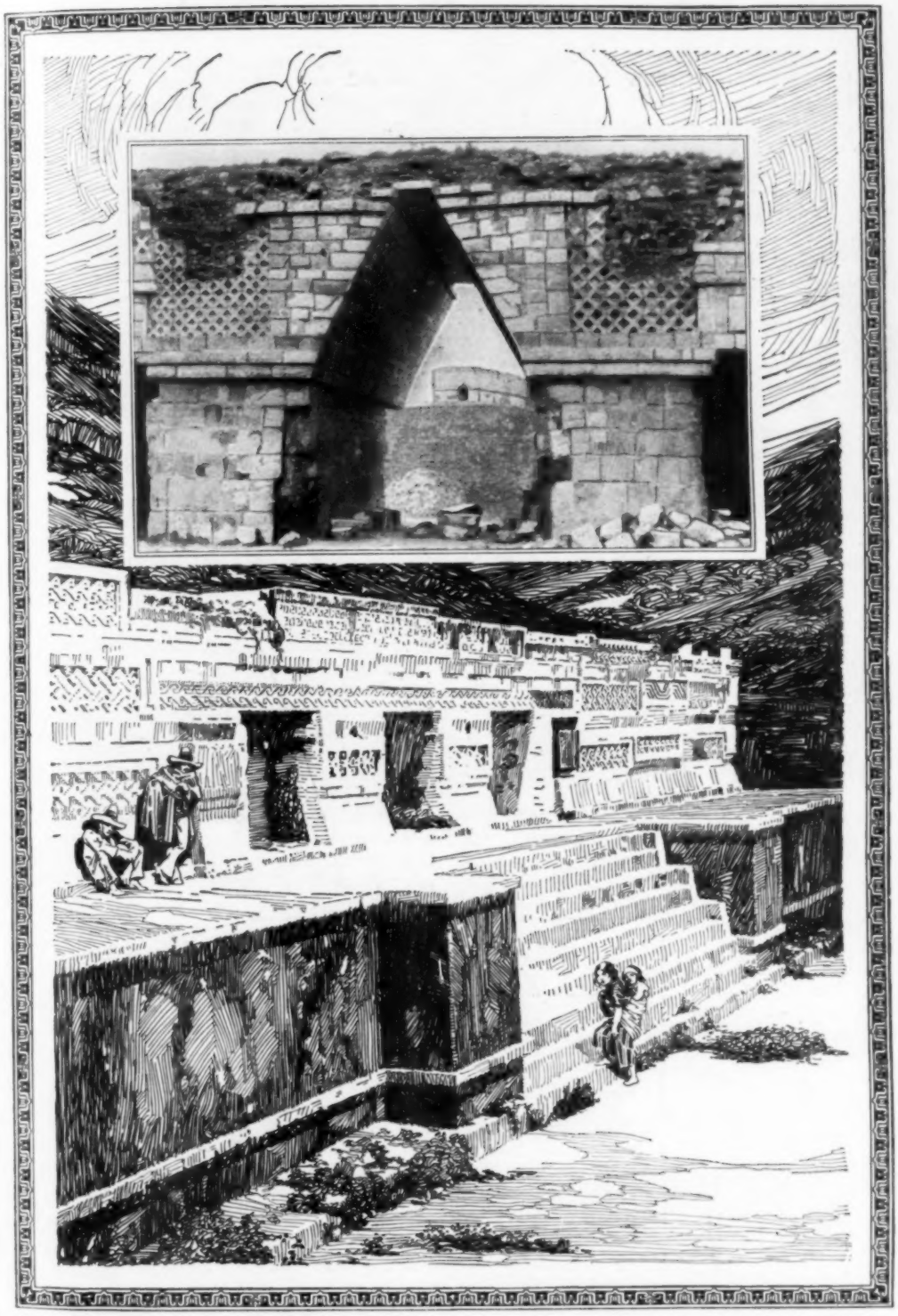
Sand and Debris of the Ages Buried Abandoned Cities of Long Ago. In Penetrating Their Depths, Explorers Employ the Cheap Native Labor That Is Always Close at Hand



Valleys Are Rifled of Their Entombed Secrets and Gorges Are Ripped in the Sides of Mountains in Attempts to Unearth the Truth about the Forefathers of Modern Civilization



Dead Empires Are Disclosed Beneath Towering Mounds Which, Molded by the Hand of Time, Open under the Tireless Labors of Excavators Seeking Knowledge of Ancient Existences



Sunburned Wastes of the Tropical Americas Covered Architectural Marvels Erected by Ancient Tribes Whose Culture and Attainments Rivaled Those of Old Egypt

Play Safe! Twice as Many Persons Are Killed in Accidents as Die from Old Age

Carelessness Is Blamed in Nine Cases Out of Ten

ACCIDENTS, most of which are declared to be unnecessary and the result of carelessness, are costing the United States more than $2,250,000,000 annually, according to figures just made public by the National Safety Council.

Pointing out that approximately 12 million persons are needlessly killed or injured every year, the report shows that the average individual is twice as likely to die of accident as from old age. In calling attention to this needless waste of human life, the following statistics were quoted:

One person out of every eight sustains an accident during the year.

Every five minutes some person is accidentally killed and 1,380 are injured each hour.

Five times as many persons are accidentally killed or injured every year as die from natural causes.

More people are kept from work by accidental injuries than are idle from lack of employment.

During the year 1922, there were 206 American citizens killed each day by accident. Of this daily number, 38 were automobile fatalities; 35 were caused by falls; 19 by drowning; 16 by burns; 9 by machinery; 5 by street cars, and the remainder by miscellaneous causes.

On the other hand, skeptical as the average person is regarding the safety of aviation, insurance companies—who employ hard-thinking, scientific minds for the investigation of risks on an essentially economic basis—have decided that aerial passengers and pilots are a good 1,000 to 1 chance. In Europe, under government supervision, the fatality ratio ranks as one death to every 400,000 miles of flying. An American company has carried 20,000 passengers 1,000,000 miles between Detroit and Cleveland without a mishap.

In seeking to safeguard the lives and health of their workers, the industrial establishments of the United States are declared to have done more than those of any other country. Machines have been designed to make accidents nearly impossible.

At the same time, because of the importance of the human factor, every effort has been made to educate the workers by means of pictures, movies, and striking texts telling them how to avoid danger.

While automobile accidents show a heavy increase, the figures prove that the number of men involved in motor-car disasters greatly exceeds the number of women. In Los Angeles the ratio for 10 months of 1922 was 96 to 4.

"After nine years of listening to complaints on traffic, I am firmly convinced that women are a great deal more careful drivers than men," says A. A. Carroll, superintendent of police of Grand Rapids, Mich. "They do not take the chances that men take; they do not drive as fast as men, and, as a rule, are more inclined to want to live up to the ordinances."

With national, state, and industrial leaders united in a country-wide campaign of prevention, "safety first" has become a national slogan and much has already been accomplished. More, however, remains to be done, as is shown by a comparison of the accident figures in the United States and England, where, in proportion to the population, the mortality is half what it is in America.

"War, pestilence, and famine may take their occasional toll of humanity, but I dare to look forward to the time when the fourth dread horseman, whose name is Accident, shall ride no more—when the crimson record of human carelessness shall have been bleached white," declared a director of the safety movement.

SAFETY IN THE HOME

WHILE much is heard about the hazards of industry and the perils of the street created by the automobile, it is rather startling to learn that a large percentage of the 75,272 accidental deaths in the United States last year occurred in the home.

Falls are responsible for a large percentage of household casualties.

Falls from shaky ladders and piano stools and other substitutes for ladders.

Falls down stairs because of defective steps or absence of handrails.

Falls on waxed floors or tripping over baby's kiddy kar or stumbling over little Jimmy's ball bat carelessly left on the living-room floor.

Falls from balconies unprotected by strong railings.

Falls into uncovered cisterns.

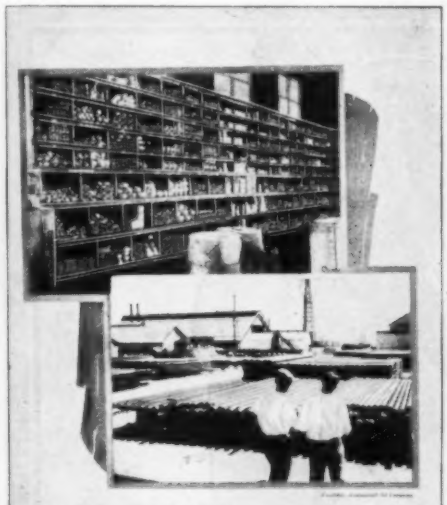
By far the great majority of these accidents are attributed to carelessness and could have been prevented by foresight.

THE·FIRE·DEMON·KILLS!·DESTROYS!

15,000 persons burned to death in one year! Countless thousands made homeless!

HELP PREVENT FIRES!

To Prevent Needless Sacrifice of Human Lives and Yearly Loss of Countless Millions of Dollars, Safety-First Posters Have Proved Their Value in Nation-Wide Campaign

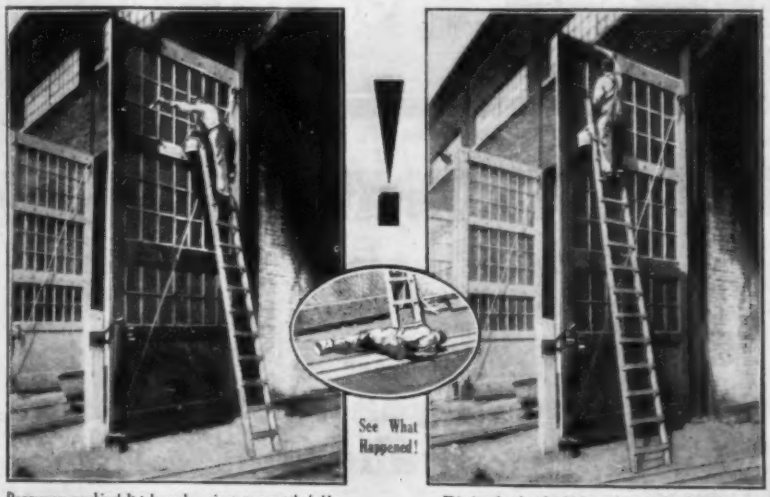


Bins and Yards Like These are Safety's Friends

Neatness means fewer accidents—and a better looking plant, too! Make your work-place a place to be proud of!

The result of trying to cut a small block on a big swing saw. The block got away from the unskilled man, tipped, jammed and broke the saw.

Don't operate a circular saw or any other machine unless you know how, and then only for the purpose for which it was made.



Dangerous reaching! It takes only a minute to re-set the ladder.

This is what he should have done in the first place.

Picture Warning Signs Are Being Used Even in China So That They Will Be Understood by All, Whether They Are Able to Read the Words or Not

"Long Pants Don't Make a Man," According to a Bulletin of the National Safety Council. "Among Other Things It Takes a Decent Regard for the Safety of Others"

In Safeguarding the Lives of Their Workers with Every Device Known to Modern Science, American Manufacturers Have Done More than Those of Any Other Country

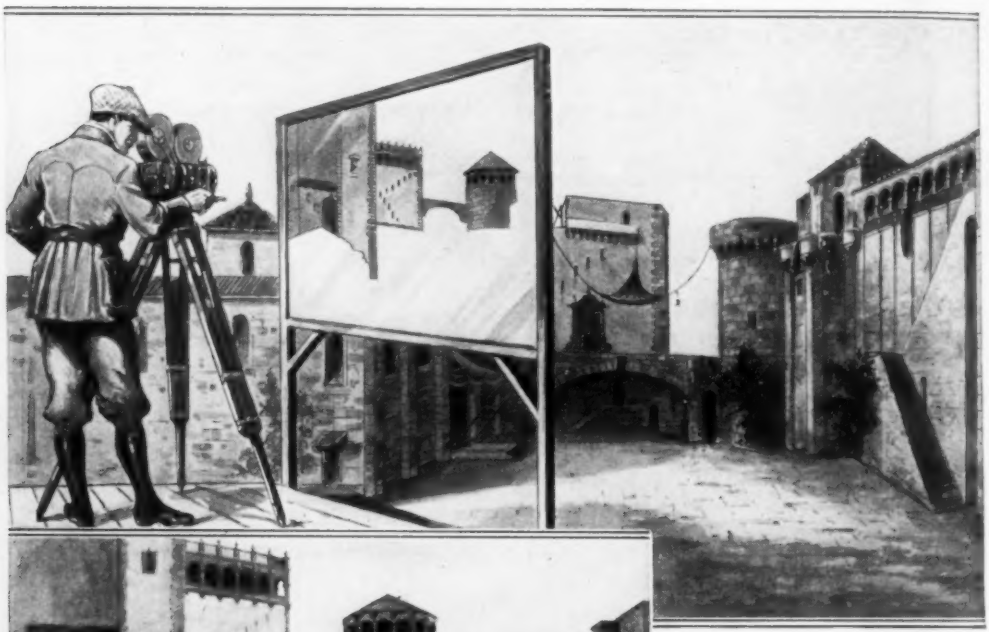
"Take Your Time! Better to Lose a Minute than to Lose Your Life," Is the Message Posters Carry to All Parts of the Country in Safety-First Campaign

Although Automobile Accidents Claim Thousands of Lives Every Year, a Greater Number of Fatalities Are Caused by Falls, Many of Which Take Place in the Home

Another Poster, Carrying a Picture of Ben Franklin, Says: "What Is More Reasonable than an Honest Effort to Avoid an Accident in Your Work? Begin It Now!"

How the Moving-Picture Camera Lies

By Fibbing Scientifically and Artistically It Adds Last Touch of Realism to Screen



What the Director Sees Before He Shouts: "Action—Camera!"

But This Is How the Same "Set" Shown Above Looks When the Silent Drama Begins to Unwind on the Silver Screen

THERE was a time, not so very long ago, when the camera could not tell a lie, but that was before the coming of the movies. Today, by fibbing scientifically and artistically, it creates and maintains illusions that otherwise would be impossible because of the prohibitive expense.

Despite the fact that the settings now being used are more enormous and costly than ever before, it remained for the photographer to add the last touch of realism to productions showing the towering battlements of a feudal castle, a colossal Egyptian temple and its majestic background, or the beautiful architecture of a French chateau.

So real are these made to appear on the screen that the spectator is amazed to learn that they are only painted on an ordinary pane of glass, no larger than the average window. And yet that is the case in most pictures, for it has become increasingly true, on the screen at least, that things are not what they seem, and producers have learned that illusion is more effective than the truth itself.

One of the greatest problems of the films has been to obtain accurate backgrounds without prohibitive expense. If

By Painting Glass and Photographing Through It, the Production of Wonderful Spires and Skies is Possible

the scene of a story were laid at Monte Carlo, it has been necessary either to transport the players and camera men to Monaco for views that would be before the audience only for a few minutes, or to construct sets at the studio that have cost more than $500,000 in some instances.

Despite the vast sums expended, the latter method was inadequate, as it was impossible to reproduce the wonders of the Cathedral of Notre Dame, the Eiffel Tower, or the Arc de Triomphe. But, in the past two years the problem has been solved, and now Westminster Abbey, the House of Parliament, or the Tower of London may be made ready to photograph on an hour's notice. There is scarcely any building or scene in the world that cannot be duplicated.

This is accomplished by what is known in Hollywood as "glass work." Things that were never built and that did not exist except on a pane of glass in the strokes of an artist's brush, have been shown with startling reality on the silver screen, the result of a photographic trick that, in the majority of cases, is invisible, even to the expert.

Ordinarily buildings or interiors intended for blending with glass paintings are constructed to the first story, or to a height that will permit the actors to move about. Then the roofs or towers are painted on a pane of glass about six feet square. This is placed in front of the camera, so that the painted portion exactly matches the remainder of the set.

The same method has been used effectively in filming clouds which are painted on the glass and then moved slowly in front of the lens, and also in providing marvelously realistic mountain backgrounds. In some cases two glasses are used, one stationary, to represent, say an island, and the other a wrecked ship drifting across it with the tide.

Another way of producing similar results is to use small models instead of placing glass paintings in front of the

camera lens. For instance, the lower parts of a building will be built on the "lot." Then the roof and towers are constructed in miniature, being placed a few feet from the camera in such a position that the lines of the "set" and model blend on the screen.

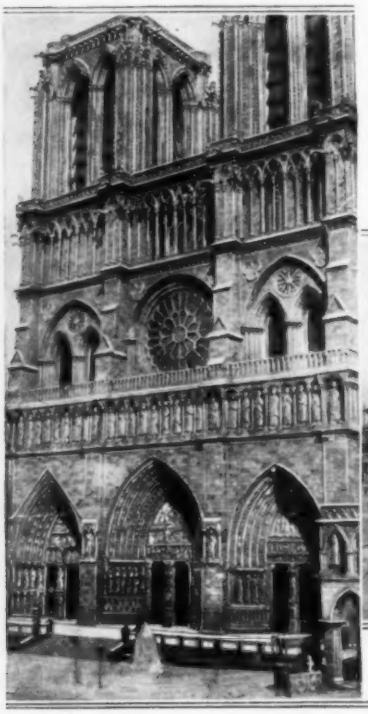
For exteriors, the miniatures have an advantage over glass, as the shadows exactly correspond to those of the actual settings. While this may seem a small detail, it is vital in the creation and maintenance of the perfect illusion demanded by the motion-picture "fan." Any slight inaccuracy is quickly detected and results in much criticism for the producer.

In a recent great spectacle, it was necessary to show the Cathedral of Notre Dame in Paris. To do this realistically, the massive front was built to a height just above the doors. Then the towers were constructed in miniature and placed in such a position a few feet from the camera that the lens caused them to blend with the lower setting. The result was so realistic as almost to defy detection.

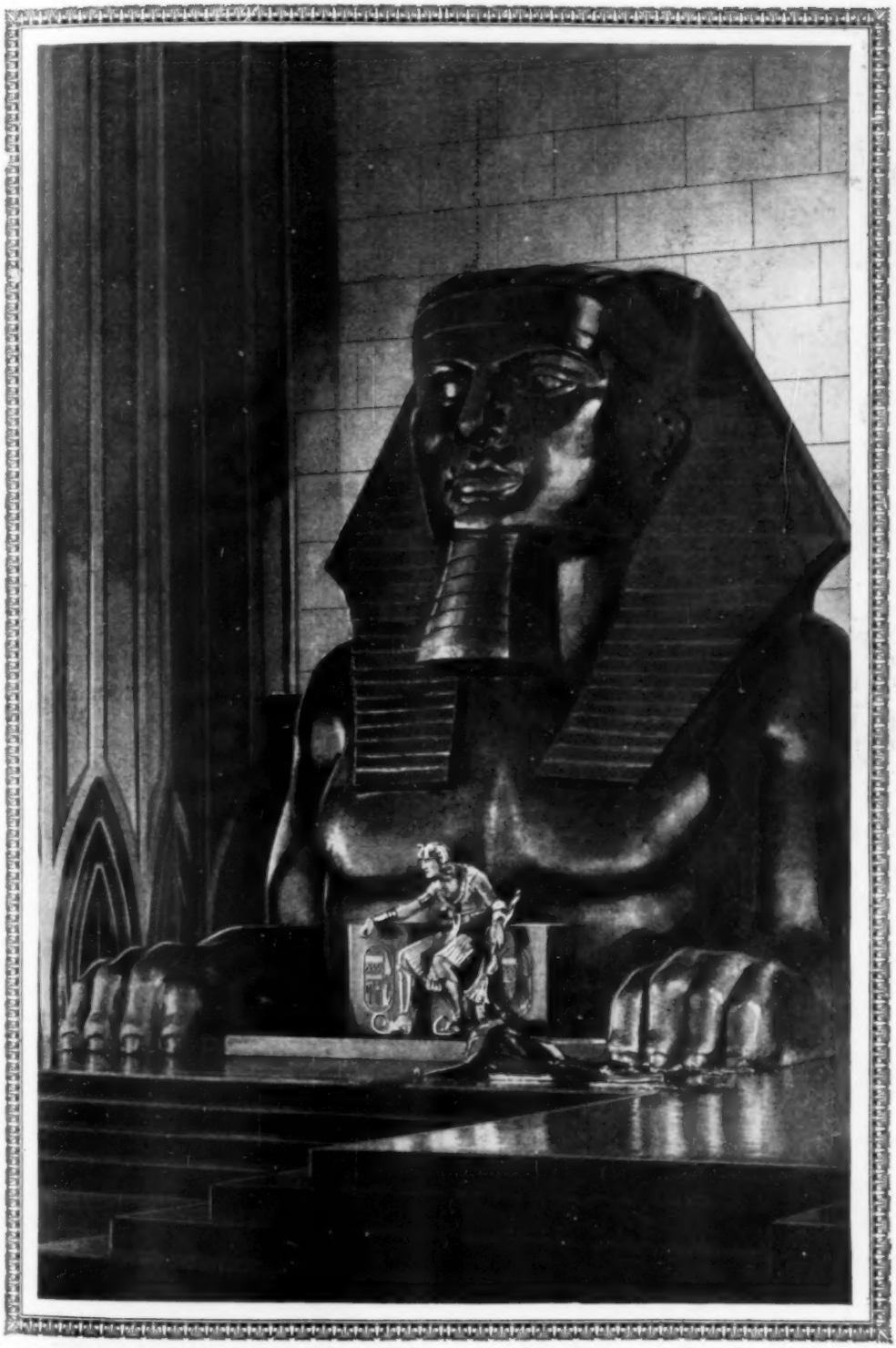
Small Models Also Are Used in Obtaining Realistic Effects

Another method is "double exposure." In this, part of the film is masked by placing a black mat of proper design over the lens. Thus the light is prevented from reaching any portion desired during the exposure. After a reel is finished, it is rewound, put back in the camera and the part already exposed masked in the same manner.

Then a photograph is placed in the correct position to be photographed on the unexposed section of the film. The result is two pictures made on one strip of film each blending perfectly with the other.

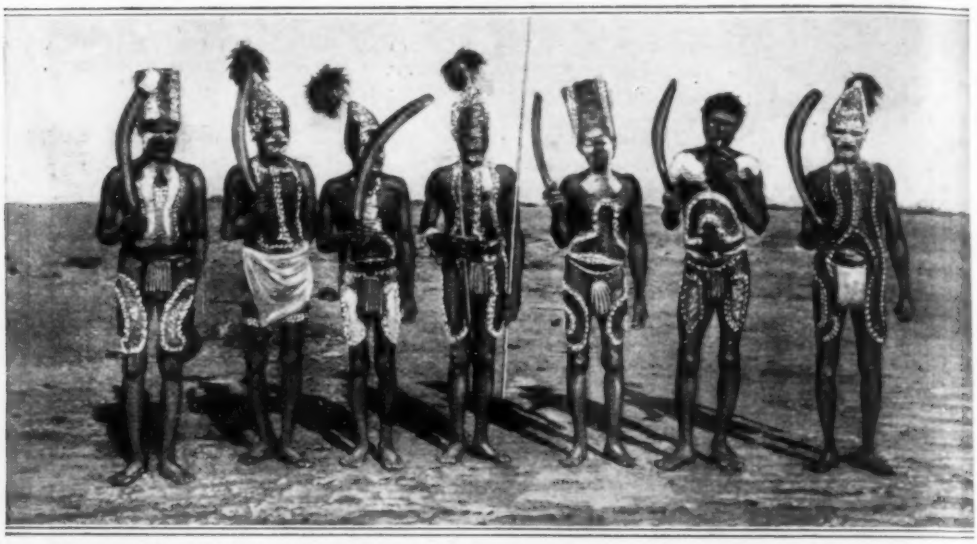


In the "Hunchback of Notre Dame": Right-Hand Picture Shows What Part of the Cathedral Was Built, the Rest Being a Miniature



Although Many of the Marvelous Effects Obtained in the Movies Are the Results of Optical Illusions, Numerous Settings Are Real and of Mammoth Size

RACE THAT MADE BOOMERANGS PASSING AWAY

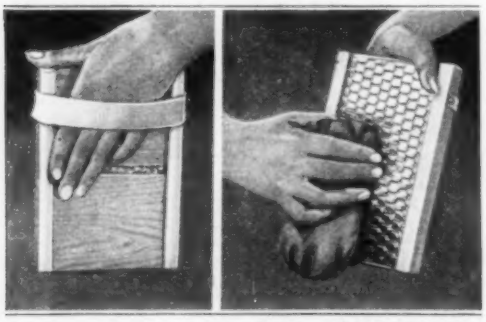


Survivors of Australian Natives, Originators of the Boomerang, Dressed in Festal and War Costumes

Natives of Australia, inventors of the boomerang, are fast becoming extinct. Numbering about 200,000 a century ago, less than 2,000 are to be found today. Like all passing races, these people for many years gradually have been discarding their ancient festal and war costumes. Recently a traveler persuaded some of the survivors to array themselves as did their forefathers years ago, and pose for pictures. The blackfellows are of mysterious origin, yet the numerous researches made to disclose the secret of their ancestry seem to indicate that they descended from Caucasians. The men have been noted for their wonderful tracking abilities and some have been found to have a beastlike keenness of scent.

SCRUB BOARD FITS OVER HAND FOR USE OF TRAVELERS

Small scrub boards, that can be used in a bowl, are being made to save students,



Small Scrub Board for Travelers and Tourists That Can Be Used in Washbowl

tourists, actors, and others from bending over a tub when they have only a few pieces to be washed. Held in the hand by a canvas handle across the back, they are designed to accomplish the same work that a larger board does. The rubbing surface is of corrugated tin in a light wooden frame.

HOT WEATHER FORMS ICE IN COAL MINE

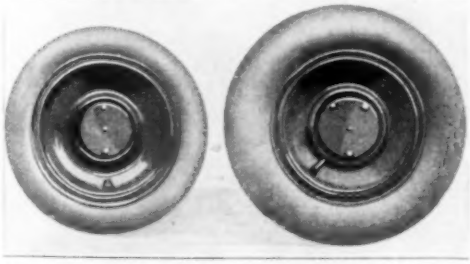
During the summer, ice is mined from a coal pit located in an eastern state. Cold air seeping through earth fissures in winter cools the rocks to a temperature far below freezing, but no ice forms because the atmosphere is too dry. At its depth the heat of summer cannot reach the vault. During warm months, the shaft becomes moist, and when coal was being dug there recently, it is said, the miners had to remove three or four carloads of ice every morning before they were able to get to their posts. As a result, the working was abandoned as a source of fuel, leaving it entirely free for use as a natural refrigerator.

MUSICAL TONE ON TELEGRAPH IS FASTER THAN CLICKS

Using the Morse code as a basis, an army officer has invented a system of transmitting messages by telegraph and radio. By making all signals of the same length but of varying intensity, it is said to result in a 165-per-cent increase in sending speed over the old method. An accuracy of receiving heretofore unknown also is attained, it is reported, while the likelihood of interference in wireless broadcasting and violent disturbances in the air are lessened. Instead of alternately turning on and shutting off the current, the words are formed by causing electricity to flow uninterrupted, like a continuous musical tone. A faint sound would represent a dot, a louder one a dash, and a greater vibration a space. Communications may be sent automatically by a transmitter of the perforated-paper roll type.

BALLOON TIRE ON AUTO WHEEL ABSORBS SHOCKS OF ROAD

Decreasing the size of automobile wheels and fitting them with tires of large diameter makes their riding smoother, according to manufacturers who have made the experiment. With this type of tire there is no lost energy and there is less wear on the treads, it is claimed. Travel over rutty or bumpy roads becomes even and danger of skidding is greatly reduced. Lower air pressures are permitted and, in tests, it is reported that gasoline mileage



Greater Riding Comfort Is Claimed for Balloon-Tire Arrangement When Compared to the Ordinary Wheel

was increased three to five miles a gallon. An additional advantage is the ease with which sand and deep mud can be negotiated, even by heavy cars.

¶ Experiments to develop a gas for killing earthworms that damage the greens of golf courses are being conducted by government experts.

BUILT-IN CLOTHES MANGLE FOLDS INTO CLOSET

Folding into a closet space, a clothes mangle is being made that combines labor and space-saving features. Since it is

Clothes Mangle Built in Wall That Conserves Valuable Space as Well as Saving Labor

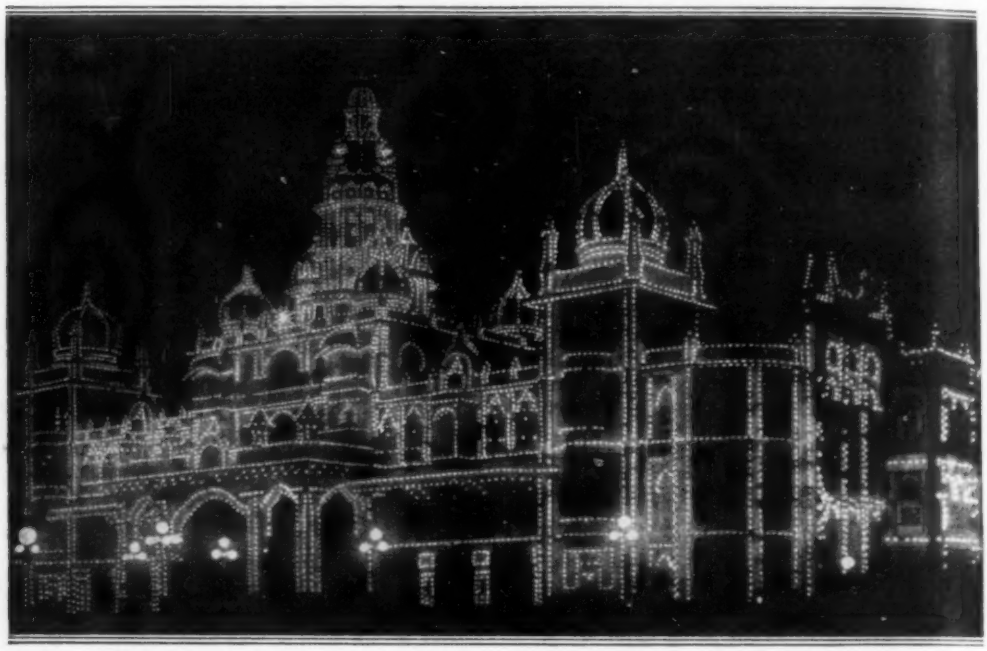
out of the compartment only while being used, the efficiency of a kitchen or laundry room is increased. Although weighing 300 pounds, it is so balanced on ball bearings that it can be lowered or raised with little effort. Specially adaptable to city flats where conservation of space is important, it is operated by electricity, and reduces hand labor to a minimum.

CONDOR, LARGEST FLYING BIRD, PASSING FROM LOFTY HOME

In the clear, cold heights of the Sierras, the American condor, giant vulture of the air and the largest bird that flies, is making its last stand for existence. Although the huge creature still wings its almost solitary way over the lofty range, it is facing the necessity of hunting a new home. Not more than a century ago it held sway over the sky course from snowy Mount Hood on the north to San Jacinto on the south. This feathered giant nests only once every two years and lays but one egg in an inaccessible crag near the mountain top. After the youngster is hatched it remains for months a helpless chick wrapped in its soft natal down.

FLOOD OF LIGHTS COVERS PRINCE'S PALACE

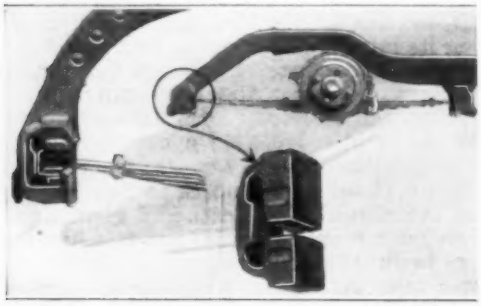
During religious ceremonies and state celebrations, the palace of the Maharajah of Mysore, in India, is lighted by thousands of electric bulbs, strung all over the massive structure. Against the dark background of night, the home of this native ruler, located in Madras, glows and sparkles like a jewel. So magnificent is the sight, that the palace is often referred to as "the most gorgeous abode in the universe." Within the borders of Mysore are located the famous Kolar gold fields, worked by electricity generated by water power.



Palace of Maharajah of Mysore, Rich State of India, Set Aglow by Thousands of Incandescents During Religious Ceremony, Has Been Called "Most Gorgeous Abode in the Universe"

AUTOS "FLOAT" OVER BUMPS ON BLOCKS OF RUBBER

Shock insulators, that do away with shackle bolts and "float" the spring ends in cages between blocks of live rubber, have been patented to make automobiles ride easier. Including the usual bushings, they replace many complicated parts. It is claimed they require little care and eliminate heaving and rolling on the roughest roads. The rubber blocks are said to retain their flexibility even after 200,000 miles of usage.



Shock Insulators, Showing How the Spring Ends Are Cushioned on Blocks of Live Rubber

RABBIT LIKE GHOST AND MOUSE WITH POUCH

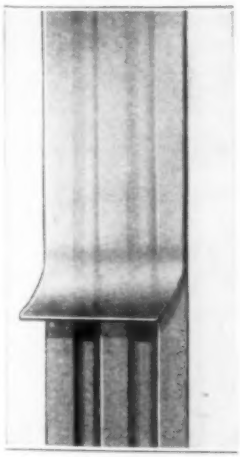
Methods of exterminating pocket mice, creatures about three inches long that carry grain in pouches in their cheeks, and ghost jackrabbits, both known crop destroyers, are being sought by government experts. The mouse, one of the few pouched creatures on this continent, infests farms in the Northwest. The rabbit, found in Arizona, has white sides

that are concealed when it crouches, but which alone are evident when it runs. Attempts are also being made to calculate the amount of forage eaten by prairie dogs in certain areas. A white-tailed squirrel, called the kaibab, whose range is limited to a plateau in northern Arizona, is also included in the survey. It is not found outside that territory, since it is cut off from all migrations by the great canyon to the south of its home and impassable deserts on all other sides.

WASTE "LIQUOR" OF PULP MILLS TO BE TURNED INTO FUEL

By a recently discovered chemical process, scientists report that it is now possible to utilize as fuel energy equal to many thousands of horsepower, some six billion gallons of sulphite waste "liquor" annually discharged into the rivers of the United States by numerous paper-pulp mills. The fluid, it is said, may be prepared for burning by being run through evaporators, which, by fermentation, change it to alcohol. An average American plant, it is estimated, discards enough of this liquid to supply 1,000 horsepower day and night. Swedish and German factories are now using a concentrated product of like refuse in the development of fuel.

INVISIBLE BELL WIRE HIDDEN UNDER PAPER ON WALLS



Thin, parallel strips of copper held between two felt paper tapes, ⅝ of an inch wide and stuck together by glue, are being made to serve the purpose of invisible bell wire. Coming in coils of 100 yards, the material can be placed under wallpaper, on the ceiling under whitewash, or on the floor under the carpet. The fact that it cannot be seen renders it suitable for secret wiring for burglar alarms.

¶ Machinery for the new wireless station at Kashgar, Chinese Turkestan, was carried over 2,000 miles by camels.

MILLION SPENT DAILY FOR ICE IN UNITED STATES ALONE

Combined ice bills of residents of the United States approximate a million dollars a day, according to a recent announcement. The latest available figures show that the factory value of the ice produced in one year, exclusive of that made by large establishments solely for their own use, approximated $187,000,000. Although harvesting of the natural product has steadily decreased, it is calculated that about $37,000,000 worth is still cut from streams, lakes, and rivers of the northern states.

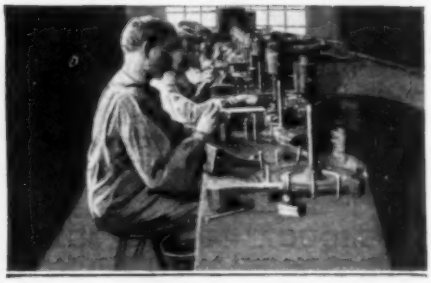
Breaking Cakes of Ice Loose from Containers Immersed in the Brine Pool

HANDLES ON FRUIT-JAR RINGS MAKE OPENING EASIER

So that the cover of a fruit jar may be easier to remove, rubber rings with sides that extend outside the metal top, are being made. Pulling these "ears" allows air to enter between the rubber and the cap, thus preventing any sticking, and eliminating the use of hot water to loosen the cap. Merely drawing out the sides is sufficient. If the ring is taken entirely off, the jar can be opened with but little effort.

UNCOVERING BRILLIANCY IN HEARTS OF DIAMONDS

Sorting and Weighing Raw Diamonds



Cutters Who Give Finish to Rough Stones

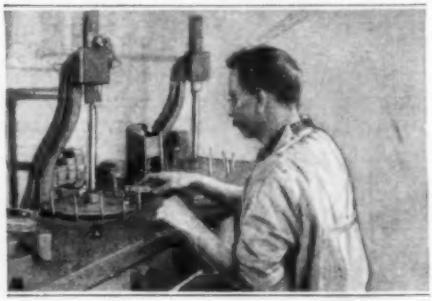
Searching for Flaws in Uncut Gems

Placing Steel Cutting Disk in Machine

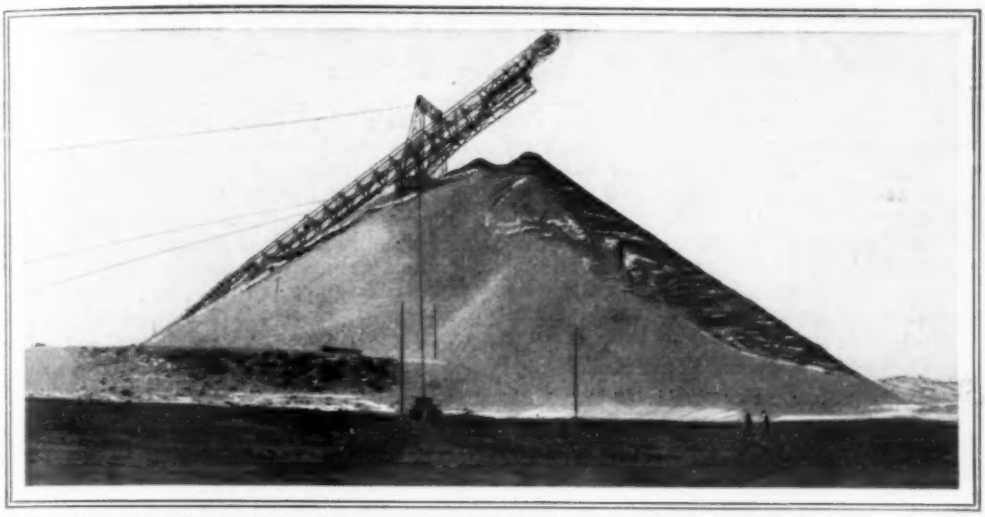
Sawing Faulty Stones into Pieces

Pulverizing Useless Stones for Grinding Dust

Rubbing Diamonds Together for Shaping



Grinding Facets Against the Dust-Coated Disk



Dump Heap Near Diamond Mine Where the Cast-Off Dirt Is Piled after Giving Up Its Treasured Gems. Months of Exposure to Weather Crumble It for Careful Screening

Search for Diamonds Filled with Thrills

Lure of Sudden Wealth Results in "Rush" When Precious Stones Are Found in Any Part of the Country

JUST a short time ago, a famous diamond expert received a caller who exhibited a small, odd-shaped object which seemed to half hide a gleam and a glitter.

"Where did you get it?" the visitor was asked.

"Well, I'm a merchant, and a woman brought it in to me. She found it in the crop of a chicken. What is it?"

"Diamond."

Although the part of Illinois from which that chicken came never yielded another specimen of pure carbon, the fever spread all over the country. In one day, a dealer received three high-grade diamonds—one found in Wisconsin, another from California, and a third from Arkansas.

Diamond - hunting contains the greatest amount of adventure and pure luck of any known outdoor occupation. A diamond may be picked up by anyone, in practically any state in the union, and then, no one else may find a real gem in that locality again for years.

Putting Diamond in Socket for Grinding: Insert, Cross-Shaped "Knot" in Gem

Almost the same thing is true with fresh-water pearls. A few years ago, a man placing a pump in the Fox River, just west of Chicago, found two pearl-carrying clams. Immediately he started clamming, and brought out more than a hundred pearls of varying qualities. His profits were over six hundred dollars.

At once that section became the Mecca of thousands of fortune hunters. Boys and men clammed it and combed it. It is doubtful, however, if the entire summer's operations along more than thirty miles of river yielded a thousand dollars' worth of pearls.

Another valuable stone often found in this country is the sapphire. Montana yields these stones regularly, and in many cases a month of sapphire prospecting there will produce handsome returns. There are, perhaps, 15 semi-precious stones often located in the United States, foremost of which are amethyst, agate, topaz, moonstone, opal, cat's-

eye, garnet, aquamarine (beryl), and petrified wood.

Uncut, these stones have little value. Cut, four-fifths of their value lies in the work that has been put into them. The cutting has become an industry in itself in America. However, the real romance of stone-cutting is found in the story of the diamond. When an uncut, or rough, diamond comes to the cutter's bench, the gamble begins. How profitable his investment is, depends upon his buyer's ability to judge the type of stone. What results from a rough diamond, rests on how it breaks, how nearly flawless it is, whether it is "knotty," and what percentage of it must be wasted.

In cutting, the average diamond loses 42 per cent of its weight. When it loses more than 45 per cent the cutter's worries begin. Sometimes it will cut down to a third, or even a fourth. Add to this the fact that it takes as long as two months to split, shape, saw, and grind or polish the 58 facets of a "knotty" stone, and an idea of the cost of whittling these precious bits of carbon is obtained.

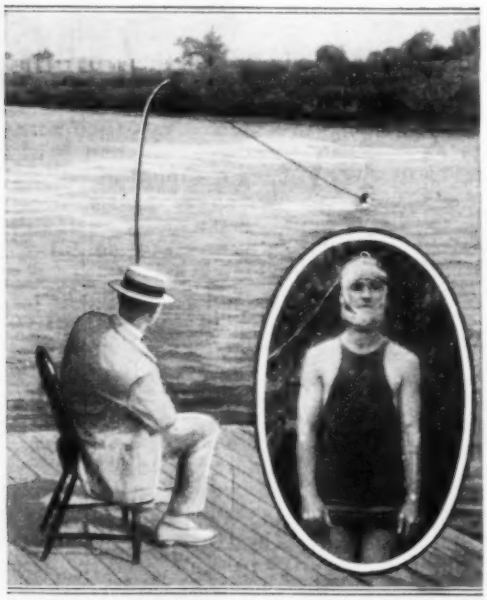
Diamonds are found free or in matrix—and when in matrix, are often combined with gold or iron. It is not at all unusual to see a matrix containing one or two diamonds and a couple of gold nuggets. Free diamonds, like gold nuggets, are found in "bearing" streams.

When the rough diamond comes to the cutting bench, an expert there studies it to learn whether it is "two point" or "three point;" that is, to determine how it can best be cut. He searches for flaws and for the grain. Then he splits it to free the portion he wants. Next it is shaped. A gem is put into a lathe and another uncut stone is applied to it the same as a tool is put against something it is to shape, and rotated at great speed.

Then comes the sawing between thin disks of copper revolving at high speed. With soft stones, a diamond of, say a carat, can be sawed in from eight to twelve hours. But if that diamond contains a "knot," which is much the same formation as a knot in wood, the sawing may take weeks.

After the sawing comes the "polishing," or the putting on of the facets. The diamonds are fastened in a socket of tin and ground against revolving disks saturated with a solution of olive oil and diamond dust. This may take 40 hours, and when knots abound it might require 40 days. A large cutting establishment had a seven-carat Brazilian stone so hard that, after eight months of cutting and grinding, they were compelled to admit that it was too hard a nut for them to crack. It is still uncut.

And that's the reason why diamond-hunting and diamond-cutting are rich in the element of chance—and why the industry is one big gamble.



Angler, Playing the Game of Human-Tarpon Fishing, Trying to Reel in His Unwilling Catch

ANGLING FOR HUMAN "FISHES" IS POPULAR WATER SPORT

Human-tarpon fishing, a game in which the angler, equipped with deep-sea tackle, tries to "land" a swimmer, is one of the latest water sports. In the contest, the line is tied in the ring of a special head-gear worn by the bather. At a given signal, the fisherman tries to reel in his catch. If the "fish" stays out of reach for 10 minutes, or breaks the line, the angler loses.

BRUSH ON TYPEWRITER CLEANS ALL CHARACTERS AT ONCE

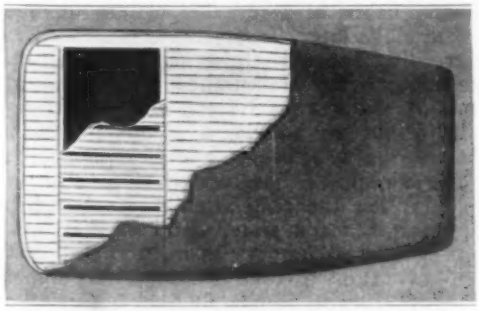
Attached permanently to a typewriter, a brush is being made that cleans all of the type in one operation, requiring only a slight pressure on its frame to move it over the surfaces. Shaped to conform with the arc of the character "bank," it is always ready for use and does not interfere with writing. The stiff bristles remove any dirt without soiling the fingers.

FORESTS TURNED INTO STAMPS TO SUPPLY NATION'S NEEDS

In a single year more than half a hundred acres of spruce trees, the only kind that produce the quality of pulp desired, are felled to supply the nation with postage stamps. According to the last count, 41,175 of these forest giants, covering 65 acres, were cut down for the year's postal script, which totaled 1,485,000 pounds, an amount sufficient for an issue of 4,150,000 seven-column, 20-page newspapers, or, if turned into lumber, building material could have been provided for 65 bungalows. If all the stamps used annually were placed in a single strip, they would make a ribbon of color 200,000 miles long and would wrap around the globe eight times. Arranged end to end, the usual sheets of 100 would form a brilliant sash 20,000 miles long, or, stacked one above the other, would build a shaft eight miles high. A single day's issue, valued at approximately $1,000,000, is 50,000,000 and requires 3,000 pounds of paper, 2,200 pounds of ink, and 3,200 pounds of gum. There are 47 different varieties in 15 different shades.

SAFETY ROOF ON MOTOR CARS PROTECTS RIDERS' HEADS

To prevent passengers from bumping their heads against the top of inclosed automobiles when passing over bad roads, a safety roof has been designed. In building it, a hole is left over the rear seat. This is covered with bands of canvas webbing, which support the fabric cover. In the event of an accident where the rider is



How Safety Roof for Inclosed Automobiles Is Constructed to Protect Heads of Passengers

thrown against the ceiling the webbing gives slightly, and, instead of the head striking the rigid cross member, the shock is broken by the soft top. This form of construction does not mar the appearance of the roof in any way.

CANNED MUSIC SAVES BEGGAR FROM TURNING A CRANK

Turning a crank of a hurdy-gurdy seemed too hard to an ingenious mendicant in Europe, so he purchased a phono-

Copyright, C. A. Oldroyd

Phonograph Used by Beggar in Europe Instead of the Usual Hand Organ

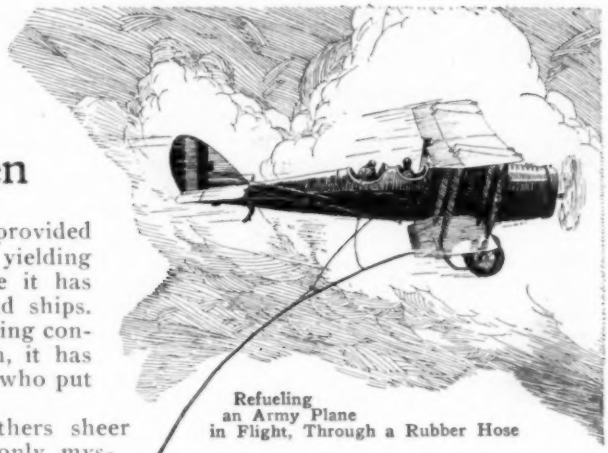
graph. With this strapped over his shoulder and a selection of records hung from the other, the old man tours the streets to eke out a living, playing the tunes for alms. As the instrument needs only an occasional winding, he finds it much easier to operate than the more ancient, heavier hand organ.

MONEY USELESS IN LABRADOR, FISH SERVE AS COIN

Fish are used as money along the Labrador coast where there are no stores, according to reports, and traders accept the finny exchange in payment for their wares. Currency is almost useless, for the residents prefer to be paid in food and clothing for their services. The last fishing season was unusually poor, because the schools of fish which have regularly furnished the chief means of livelihood to the natives, deserted the waters along those shores. In order to relieve the conditions, a paper mill that will give employment to many persons is being planned, and fishermen are raising goats to provide necessary food elements lacking in the usual diet of fish, white bread, and tea.

¶Perfumes were first employed only in religious services, and were consecrated to that use.

Pilots and Planes That Reached the Port of Missing Men



Refueling an Army Plane in Flight, Through a Rubber Hose

FOR centuries the sea has provided thrilling tales of adventure, yielding romance and treasure, the while it has taken its annual toll in men and ships. Today there is another element being conquered—the air. Like the ocean, it has now and again betrayed the men who put their faith in it.

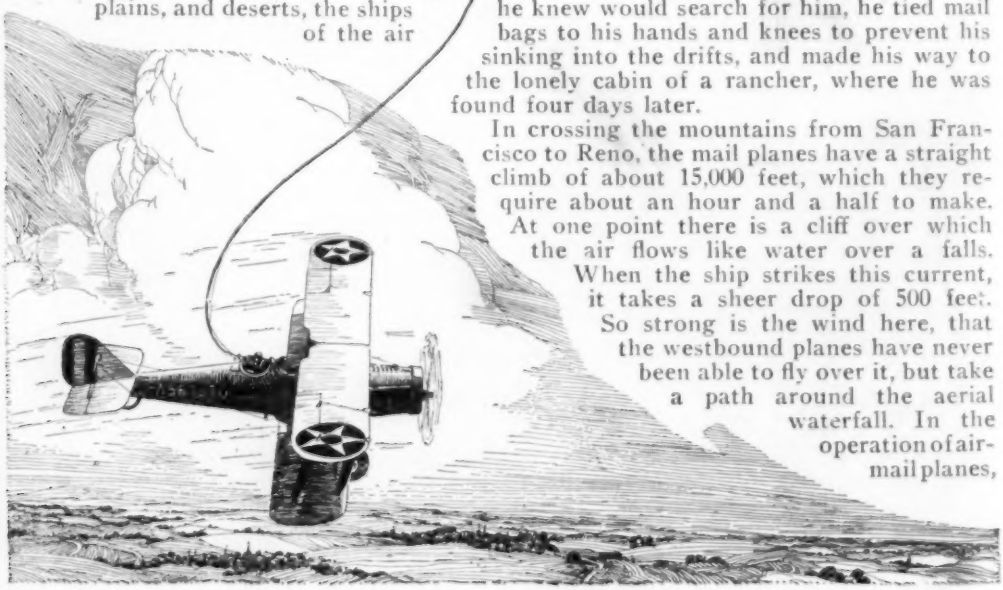
Some have had adventure, others sheer tragedy, while many have left only mysteries. Wherever flying men gather, stories may be heard of those who have gone up into the clouds without being heard from again. Of late, the actual disappearance of airplanes has come to be attributed to pirates and bandits, bootleggers, rum smugglers, and ordinary thieves.

This is largely due to the growing perfection of the planes. In 1922 there were 89,435 flights by civilians in the United States, with only 70 accidents, and of these, seven were fatal. Over 5,000,000 miles have been covered by postal pilots with only one fatality, and 20,000 passengers have been carried by one commercial company without a single mishap. Every day, winter or summer, rain or shine, through snow, sleet, fog, wind, and storm, and over mountains, rivers, plains, and deserts, the ships of the air mail have flown on schedule time.

In the past four years, the postal aviators have demonstrated that flying through the air at a speed of 100 miles an hour is really safer than walking, for no man or group of men could walk the same distance without a few fatal accidents. Adventurous and resourceful, the air-mail pilots are a picked body of men, who have proved their endurance and courage in many tests.

While flying with mail from Salt Lake City to Cheyenne, Pilot Henry G. Boonstra lost his way and was compelled to make a landing in the snow. Although his ship was not "cracked," the snow was so deep that he could not resume his journey. After spreading his overalls out in the snow as a signal to other planes that he knew would search for him, he tied mail bags to his hands and knees to prevent his sinking into the drifts, and made his way to the lonely cabin of a rancher, where he was found four days later.

In crossing the mountains from San Francisco to Reno, the mail planes have a straight climb of about 15,000 feet, which they require about an hour and a half to make. At one point there is a cliff over which the air flows like water over a falls. When the ship strikes this current, it takes a sheer drop of 500 feet. So strong is the wind here, that the westbound planes have never been able to fly over it, but take a path around the aerial waterfall. In the operation of air-mail planes,



Air Mail Pilot Who Lost His Way in a Blizzard in the Mountains

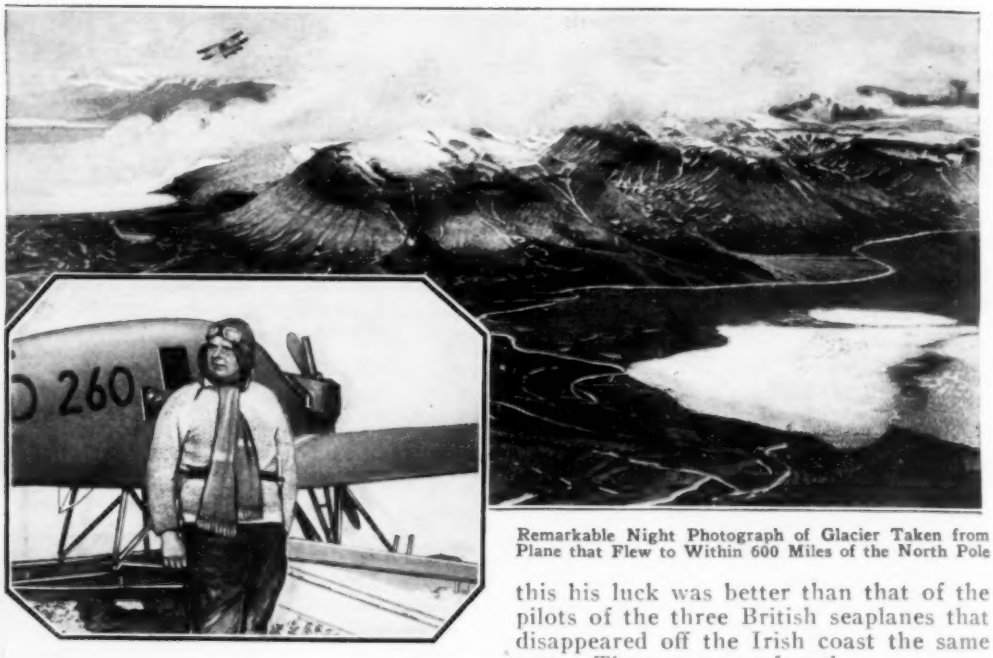
the cost is about 50 cents a mile. After 100 hours (10,000 miles) in the air, each ship is overhauled and the engine changed. A test has been conducted on one plane running between Cleveland and Chicago. It has traveled 135,000 miles without a single complete overhauling. In all of that travel, one minor repair was made and a total of about $380 worth of work put in. Usually the first part of the plane to wear out is the wing fabric. Then comes the body, which is made of three-ply wood with birch on the outside.

The duties of army and navy pilots subject them to flying in all sorts of weather, which accounts for many of the accidents. The greater number of crashes, however, are caused by the so-called gypsies, or aerial barnstormers, in flying over bad territory in machines which have not been kept in good repair. But, while each year witnesses fewer accidents, their supreme adventure has been the beginning and the end for many aerial voyagers. Of such was the disappearance of Capt. Mansell R. James, British airman, who on May 29, 1919, left Lee, Mass., continuing a flight between Boston and Atlantic City. No trace of him has ever been discovered, although the air forces of three governments (British, Canadian, and American) sought for him for some months.

Then there was the polar expedition of Prof. S. A. Andree, the Swedish scientist, and his two companions. Theirs was the first aerial disappearance of record, and one of the most striking. They set out in a free balloon in July, 1897, with the object of drifting across the North Pole. Only one message reporting that "all's well" was received from them by carrier pigeon, and it is believed that they perished on top of one of the North Greenland glaciers.

Later, a naval balloon drifted out to sea from Pensacola, Fla., carrying a full complement of officers and men. They have not been seen since. Another disaster at sea took place during the London-Australia flight three years ago. Captains Howells and Henry Fraser flew safely from London to Taranto, Italy. They took off over the Mediterranean with the African coast as their objective. Several days later their wrecked plane was found off Corfu, only one body being recovered.

Of late, flying has become almost as common as any other means of transport for the persons engaged in it. But it was only two years ago that Lieut. Alexander Pierson, en route from El Paso to



Remarkable Night Photograph of Glacier Taken from Plane that Flew to Within 600 Miles of the North Pole

Florida, was lost in Mexico for eleven days. He rode out of the southern republic on a mule. His plane lay at the bottom of a deep canyon into which he glided when his motor stalled. His experience was relatively peaceful, however, to that of Lieut. Ross M. Hardendorf, one of the pilots of the Atlantic fleet, whose motor stalled 10,000 feet up off the coast of Cuba.

When it struck the water, it turned upside down, and the lieutenant climbed on top of it and was arranging his handkerchief on a wing strut as a distress signal when he was interrupted by a school of man-eating sharks. They charged him in droves, singly, and in pairs.

Night fell, and Hardendorf was confronted with the possibility of tearing his plane to pieces to defend himself. Morning brought the sun and a terrible thirst. After hours of labor, the aviator fashioned a makeshift evaporator from tubes and piping from the machine. With this he got about a quart of water. Late the next afternoon, he was rescued by another seaplane. With all this his luck was better than that of the pilots of the three British seaplanes that disappeared off the Irish coast the same year. They were not found.

Details of hardship and adventure survive only with the victors in the struggle with the elements. Near Tabora, in the former German East Africa, are scattered parts of the largest of the British airplanes which set out in February, 1920, from Cairo to Cape Town. All came to grief in one way or another.

One machine with five passengers managed to fly southward for 2,628 miles. Rough winds and intense heat pursued them all the way. The glare of the sun on the desert sands made landings extremely difficult and dangerous. The engines leaked and overheated repeatedly. Finally, the party landed in a jungle on the banks of the Nile.

At one place, 40 miles from the nearest town, they were forced down in the long swamp grass. Elephants, hippopotami, and tigers gathered outside of the circle of light cast by their campfire, while all hands labored throughout the night to get away. Next day they came down for two days' delay. The heat evaporated the gasoline as soon as it was put in the feed tanks.

Naval Plane that Attained a Speed of 238 Miles an Hour in Practice Flight

Once again in

the air, they became lost in the haze from bush fires and could not pick up their landmarks. The water supply in their motors became exhausted and they found themselves gliding toward earth with nothing but haze and jungle in sight. Minor repairs were made, which, however, required hours because of the heat that again and again laid them prone in the tents where the food and medical supplies were kept from poisonous insects.

They worked as rapidly as possible, for they were in hostile territory, surrounded by savages who now and then appeared in the bush. The black men had never before seen a flying machine. Not understanding it, they remained at a distance.

Up and off again, the party eventually came to solid jungle and anthills. These tipped the plane first one way, then another, ripped off its landing gear, broke its wings, and sprained its back.

It never flew again, its big body now being part of a chief's cabin, while the wings were used as roofs in a white settlement near by.

MILKY WAY IS "YARDSTICK" TO MEASURE UNIVERSE

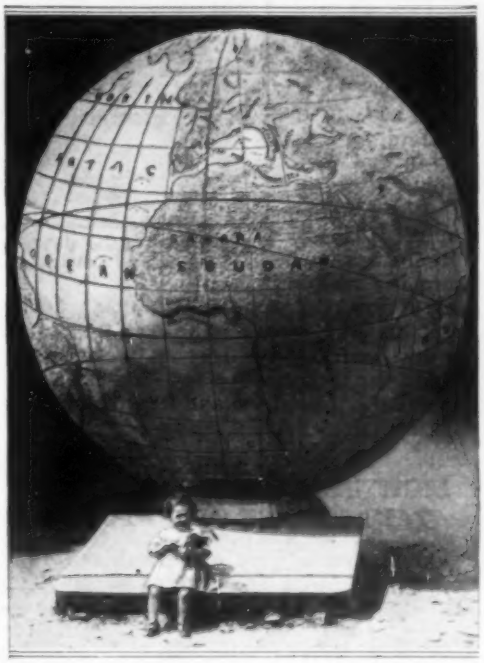
Assuming that the universe has certain limits, its diameter is 10,000 times the length of the Milky Way, a scientist has calculated. The length of this "yardstick," of the heavens is estimated to be 30,000 times the distance that light, traveling at the rate of 186,000 miles a second, covers in a year. As rays from the sun reach the earth in about eight minutes, according to this expert's figures, it would take a beam of such light a million years to make a circuit of the universe. The same task would require three quadrillion years for the fastest airplane, five and one-half quadrillion years for the swiftest automobile, and 11 quadrillion years for an express train speeding at the rate of 60 miles an hour.

TRAP TO CATCH THIEF IN AUTO SNAPS AROUND ANKLE

To ensnare an automobile thief, a concealed trap has been invented that is intended to snap around his ankle automatically when the gear is shifted. As the device is sprung, a warning signal is sounded to attract the attention of policemen or passers-by. Grasping the law-breaker's leg tightly, the iron jaws of the "foot-cuff" prevent his escape from the car until the owner unlocks them with his key. Hidden in the floor in front of the foot clutch, the attachment swings upward and fastens itself securely when an attempt is made to put the machine in motion.

"EARTH" CUT FROM SOLID ROCK WEIGHS FORTY TONS

Carved from solid stone, a model of the earth has been erected in England that serves as a silent teacher of geography to passers-by. Weighing 40 tons, it has a diameter of 10 feet. On its surface are chiseled the continents and oceans, each plainly marked. Longitude and latitude are indicated as well as the equator and the tropical belt. It is so poised as to represent the position of the sphere in space.



Miniature of Earth That Was Carved from Solid Stone Becomes Silent Teacher of Geography

¶Estimates place the total number of newspapers published in the world at 56 thousand.

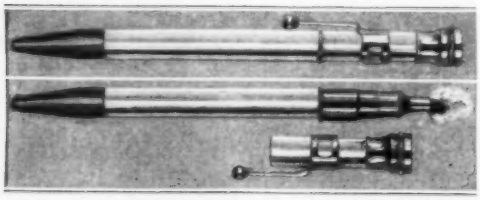
HUNTERS CAPTURE ELEPHANT HERD ALIVE

It required weeks of preparation and the labor of hundreds of men recently getting ready for a wild-elephant hunt in the upper reaches of India, to capture the animals alive. A strong stockade, or keddah, was built of timber at a suitable spot, but great care was taken that the big beasts were kept away from the vicinity while the trap was being erected. A funnel-shaped entrance led to the interior, and there was nothing to give the quarry any warning that it approached a pitfall. The beaters penetrated the forest and locating a herd, surrounded it for the drive toward the stockade. Every sort of noise-producing device available was used, as the elephant hates an uproar. Lighted torches were swung to and fro behind the terrified beasts as they charged forward and kept them from turning back. After many days of constant driving, the exhausted creatures finally reached the hidden entrance to the trap. More beaters were put to work, fireworks were let off, and the noises increased until, with a rush, the lumbering brutes poured into the inclosure. Then began a wild stampede to get out. More fire frightened them away from the stout fences which they were bent on tearing down. When they had become somewhat accustomed to their surroundings, natives on tame elephants entered the corral and proceeded to rope and tie the captives. Some submitted tamely, while others fought to break away. It is said a wild elephant will never attempt harm to a man while he is on another elephant's back. Forty-two of the mammoth creatures were secured, but six were so dangerous they were allowed to go back to their forest freedom.

Trapped Jungle Giant Vainly Seeking to Break Down the Stockade into Which It Has Been Driven by Hunters

LIGHTER IN END OF PENCIL TAKES PLACE OF MATCHES

Pencil and lighter are combined in a recent invention for the smoker. The benzine-saturated wick and tiny metal igniting plate at the top are intended to last indefinitely. Leads can be renewed. A hard rubber cap fits over the top to prevent any possibility of accident. Carried in the pocket and securely fastened by a clip, it has the appearance and size of a fountain pen. One inventor makes a combination of lighter and pen.



Smoker's Combined Pencil and Lighter That Has Size and Appearance of Fountain Pen

EGGS OF STONE-AGE REPTILE FOUND IN FOSSIL NESTS

Dinosaurs, the huge reptile creatures of prehistoric eras, laid eggs five to six inches long in nests built like those of the fowls of today, according to naturalists who found such specimens on the plains of Mongolia. These are said to reveal for the first time that these giants of the young world laid eggs. In the great fossil beds of the region the searchers were able to prove a kinship between the early mammalian beasts of Asia and America. Nine tons of "bones" were collected, including 25 eggs, whose shells were covered with a buff coating.

POUNDING CONCRETE TO MAKE SMOOTH ROADS

TO make more solid concrete with a smoother wearing surface for roads, a vibrating machine has been patented to pound air bubbles and water out of the mixture. In addition, the process is intended to save time and material, reduce labor, and eliminate the need of reinforcing. Less cement is used by mixing one part to two of sand and four of rock.

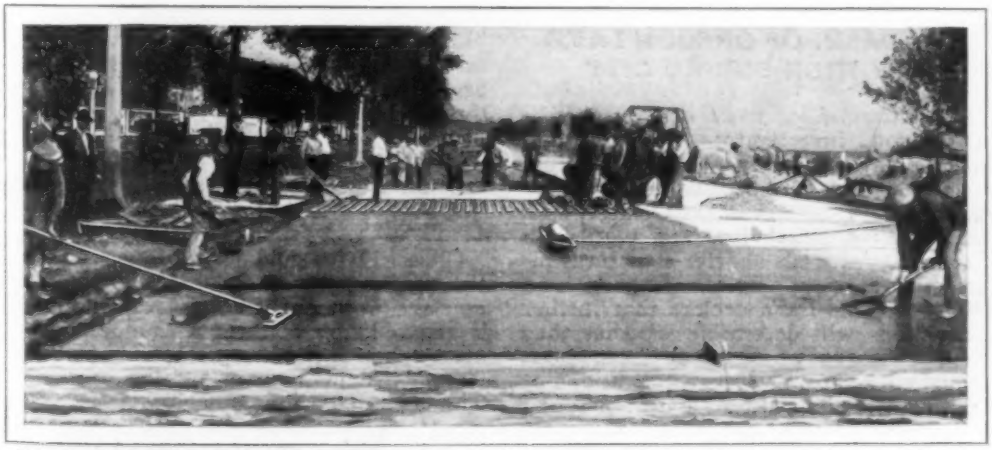
In building a road through Lincoln Park, Chicago, the material was carried in trucks from a portable mixing plant. After being spread and dragged off, it was covered with a 2-inch layer of hard granite stones. Mats of wooden screening, 12 feet in length and 16 inches in width, were then laid over the surface. Small gasoline engines, each of which was mounted on eight wide, flat wheels, were pushed onto the netting. Vibrating heavily, because the flywheels were unbalanced, they drove downward with a pressure of about 700 pounds and delivered a 50-pound blow on the upward stroke, 2,000 impulses a minute.

When the concrete has been firmly packed, the mats are carried to the next section. Surplus water on the surface is wiped away by rolling and "belting."

As a final operation a canvas belt, 2 feet wide and 14 feet long, is stretched across the section and moved back and forth by two men to smooth the hardening surface. A test is made to determine the smoothness. In a short time the material is hardened and the expansion joints of asphalt are then melted with hot irons and forced into the cracks between the cement slabs.

Vibrating Machines That Are Used to Make Denser and Smoother Concrete Surfaces by Pounding Out Air Bubbles and Water

In a recent test, before the process was completed, a five-ton truck was driven across a road built by this method. The wheels left a mark one inch deep, it is said. The same truck run over the surface of a road made without the machines sank down several inches.



How Roads Are Made by Pounding the Water and Air from Concrete, Showing Scrapers, Rollers, and Wooden Mats on Which Machines Hammer with 700 Pounds Pressure

SINGING BUGS CAGED AS PETS FOR JAPANESE HOMES

In the marketplaces and parks of Japan, vendors of singing insects peddle a variety of noisy little bugs that emit a not unpleasant sound. Popular among all classes of citizens, they are especially in demand by the children. Large stocks of the creatures are kept on hand by the dealers, who inclose them in reed cages and small birdhouses that can be suspended from a wall or carried about in the hand. Breeders of the queer songsters seek to produce species possessing strong voices with a willingness to make frequent use of them.

Bugs That Rival Birds as Songsters Are Considered Desirable House Pets in Japan. Vendors, Who Raise Them, Supply Reed Cages and Ornamental Boxes as Homes for the Insects

DRY BASIN OF OREGON LAKE MAY HIDE BURIED CITY

In the sand-filled basin of Thorn Lake in Oregon, investigators hope to find traces of an American Pompeii. Across the site of the lake bed, from which the water has long since vanished, runs a wall, straight as a plumb line and regular in shape. At intervals shorter structures intersect it at right angles. Experts who have examined them declare that further excavations will determine whether they are the works of man or have been wrought by nature. Other indications of a prehistoric civilization have been found in different parts of the state. One student of antiquity has said that the region may prove to be the locality of the Biblical "Land of Nod" and the site of Enoch, established by Cain and believed to be the first city on earth. Another old lake in the same district yielded the petrified body of a little three-toed horse, regarded as an important link in animal evolution.

ROYAL COACH IS GOLD-PLATED

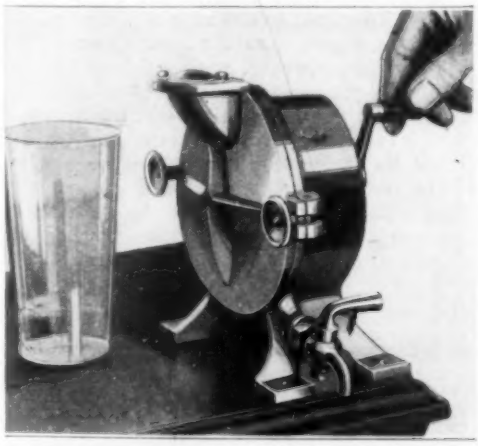
Covered with gold decorations from the tip of its pole to its rear wheels, the carriage built for Charles X of France is regarded by historians as one of the most valuable in the world. The makers were instructed to spare neither pains nor money to make the vehicle conform with regal requirements. Its cost is said to have been in excess of $200,000, but today it would be many times that sum.

NET BUILT ABOUT LIGHTHOUSE TO KEEP OFF BIRDS

Attracted by the glow of an Atlantic-coast lighthouse, birds flying at night have so endangered the powerful lenses and damaged windows that the government has been forced to build a protecting steel net about the tower's top. On a single dark, stormy night hundreds of birds meet their death in its meshes, drawn there by the rays that seem to offer a haven from the elements. The toll of each migratory season runs into the thousands. Many rare specimens have been picked up by the keepers and some have been preserved by a taxidermist. One morning's collection contained Maryland yellowthroats, several kinds of warblers, an American redstart, a water thrush, a yellow-billed cuckoo, a black-crowned night heron, gulls of every variety, catbirds, owls of different species, and ducks. Some were used to replenish the lighthouse larder.

CRANK REPLACES OLD SHAKER FOR MIXING LIQUIDS

For stirring salad dressings or mixing any kind of liquids, a machine has been invented in England that does the work quicker than a hand shaker. With a few

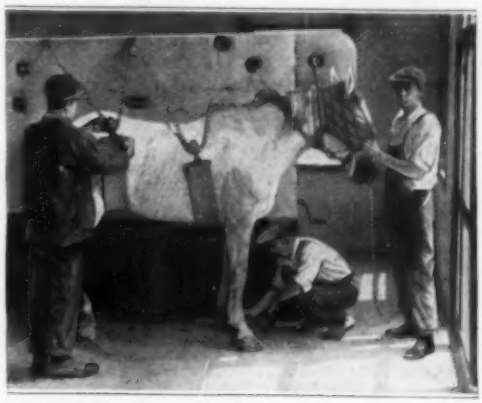


Crank-Driven Machine for Mixing Liquids That Replaces Old-Fashioned Shaker

turns of the crank handle, the materials are thoroughly blended, it is said, since the elements composing them are broken up and mingled together by being revolved rapidly inside the container. While the device for household usage is small, larger sizes are being made to combine oil and petrol for fuel, and to compound other fluids.

HORSES IN HOSPITAL TREATED ON OPERATING TABLE

Injured horses and those needing medical attention receive careful treatment from doctors in an animal hospital main-



"Patient" of Horse Hospital Placed on His Feet in Stall by Tilting of Operating Table

tained by an eastern city. Everything the sick beast needs to repair his health, from fresh air to a surgical operation, can be provided at the "rest farm." When broken bones or wounds are to be treated, the horse is strapped to an operating table while the veterinary performs his work. After the operation the table is moved to a specially constructed stall where the "patient" is again placed on his feet.

WATCH CARVED OUT OF WOOD KEEPS ACCURATE TIME

Ticking off the seconds as accurately as an ordinary timepiece, a watch, with all its parts except the steel spring cut from pieces of wood, has been made by a Russian peasant. Even the balance wheel, so vital to the instrument's accuracy, was delicately formed from wood. Skillful carving marks the fashioning of the small gears with their many tiny cogs, since these were produced with such care that the action of the hairspring turns them as easily as those of a metal timekeeper. The creator of this oddity presented it to Premier Lenin, of the Russian soviet government.

JAP FIREMEN ADD GAS MASKS TO AID IN LIFE SAVING

Fire departments of Japan are now completely modernized. Since the declaration of the "open door" policy, the nation has

Japanese Police Exhibiting Gas Masks Similar to Those with Which Fire Fighters Are Equipped

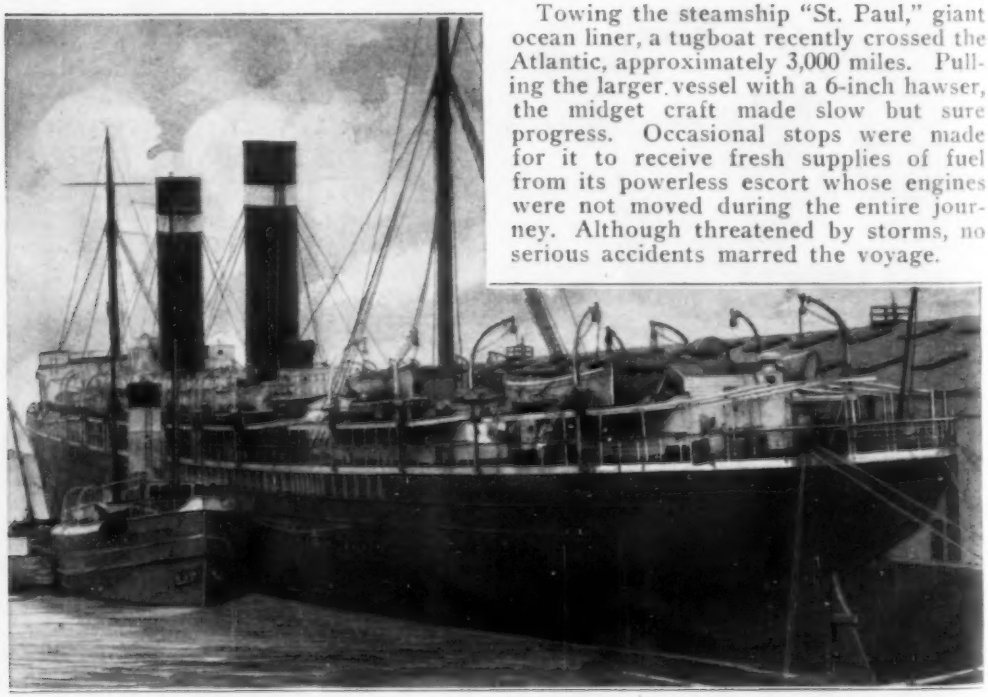
been rapidly discarding its ancient customs for those of the newer civilizations, until now it is a quaint mixture of the Orient and the western world. In the transition, the fire departments have not been neglected and now many in the larger Japanese cities are similar to those of America. Although the major changes in equipment were made some years ago, it was not until recently that gas masks and other up-to-date devices for safeguarding lives and aiding in rescue work were adopted.

ANTELOPE SMALL AS A RABBIT IS CAUGHT IN AFRICA

Exploring the jungles of West Africa, an American plantation owner in that section has taken specimens of many animals and birds previously unknown to science, according to a recent announcement. His collection of birds, now in an African museum, numbers 7,450 specimens and is regarded as the most representative in the world from that part of the dark continent. Among the strange animals he found are antelopes the size of a rabbit, a new type of flying squirrel, frogs more than a foot in length, and others partly covered with hair a half inch long.

TUGBOAT TOWS HUGE LINER ACROSS THE ATLANTIC

Towing the steamship "St. Paul," giant ocean liner, a tugboat recently crossed the Atlantic, approximately 3,000 miles. Pulling the larger vessel with a 6-inch hawser, the midget craft made slow but sure progress. Occasional stops were made for it to receive fresh supplies of fuel from its powerless escort whose engines were not moved during the entire journey. Although threatened by storms, no serious accidents marred the voyage.



Tug and Great Liner It Recently Towed Across the Atlantic Ocean by a Six-Inch Hawser, Making Slow But Sure Progress Despite Gales and Hidden Perils

Torch and Blowpipe of the Glass Worker Form Delicate Imitations of Nature's Rarest Plants

Glass Flowers Rival Nature's Wonders

Brilliant Colors, Delicate Stems, and Waxlike Petals, "Grown" Among Artificial Foliage

TO create from cold metal and fragile glass, flowers of wondrous beauty, plants and shrubs, fruits and rare vegetation, true to life in every detail, is the work of a corps of highly skilled artists and scientists who labor unseen behind the scenes in the Field Museum of Natural History in Chicago.

Reproduced exactly as they live in their native soils, these specimens represent perfect realism and truth, while smaller models show the minute structures of the most important sections. Every exhibit is displayed in full bloom, and shows the plant at its best, in the full vigor of its life, unlike those kept in conservatories where they languish under artificial conditions and lose much of the rich beauty that characterizes them in their natural homes.

Contrasted with the task of animal or bird sets, where the hide, or the feathers, the principal feature of the specimen, is ready to inclose a plaster form, the imitation of nature's gardens must be undertaken with nothing of its own to enter the work. The long delicate stems, the waxlike petals in roseate hues, the stamens, finer than silken threads, and even the almost invisible pollen with which flowers are "dusted," appear in faithful reproduction. Many plants are too small to be seen with the unaided eye, while others exist only in fossil form. Only a thorough understanding of the natural processes of growth and an attachment for the works of nature can bring results that will depict every curve and tint.

From South America a cannon-ball tree was brought. Resembling the elm in general appearance, it bears its fruits and blossoms, from which it gets its name, on vinelike branches that wind in a tangled mass from the sides of the trunk.

Almost infinite care was taken to get a perfect impression of this plant. It was first thoroughly studied and photographed before being lifted from the soil. The top foliage was discarded, and the rest taken to pieces. The branches were cut off and packed, after being numbered with their positions on the trunk. The fruits, flower clusters, and a mass of leaves were immersed in a preserving fluid, and the entire lot shipped to the workrooms. Any perishable parts that required restoration were cast in plaster, and the coloring applied on the spot.

With such perfect models before them the artist commissioned with the task of producing them in metal, wood, and glass, proceeds to build up his specimen much in the same way that it grows. First, the stem is made. In the cases of trees, the trunk is carved from seasoned wood and painted. Then steel dies are cut by which the leaves are pressed from a greenish material of rubberlike composition.

The task of making the blossom requires delicate handiwork. The glass-blower with pipe and torch begins con-

struction of the petals. He works with slender sticks of glass. For the flower of the cannon-ball tree about 600 tiny pieces of fragile glass were made for each blossom. In every detail they are shaped exactly as the preserved model. After the various parts are assembled, they go to the artist for painting, where, with marked photographs to guide him, the colors assume a harmony which equals the most perfect efforts of nature itself.

When the plants have been put together and the set surrounded by the background that shows them off in wild native lands, the effect is such as to deceive the eye of any observer, no matter how familiar he may be with the real article.

Many crafts are employed in the preparation of these specimens. Woodcarvers are called upon to create the bases of the larger ones, glass blowers for the delicate petals and small fruits, and workers in intricate metal structures to make the concealed skeletons.

Quite often a botanical exhibit is made to show the interior details of the roots and fruits or blossoms. This requires not only the steady hand of the artist for the fine threadlike veins, but a knowledge of botany as well. Nothing can be left to the imagination. If need be, the workman is packed off to some far-away part of the world to learn from actual study of the plant itself, what is needed to create it artificially. Lengthy experiments may be found necessary to obtain a combination of materials that will ably imitate peculiar colorings or queer texture of the leaves and petals of the rarer growths.

Hardly a department in a great museum can successfully carry out its designs without recourse to the glass-flower makers. Where insect life is to be portrayed in its native haunts, there is rarely an instance where vegetation that harbors the little creatures is not needed.

To give its tiny body the proper setting, to illustrate its habits, and to show better its color, the contrasts of flower and leaf are vital. Birds without trees and flowers could not be done justice when their forms have been prepared and set up for the education of the visitor. When the foliage is formed, provision must be made by the artists for a suitable position for the nest, as almost every specimen of the feathered tribe is shown in its native habitat.

Coconut Palm or Gorgeous Orchid Finds Lasting Expression at the Hands of Museum Artists

Large forest animals, fierce cat families of the jungle, and the smaller fur-bearing denizens of the northern countries, all must have home life depicted in the midst of the natural growths necessary to their existences. The busy beaver has his dam, built of heavily leafed branches, and the tree, felled by his sharp tooth, cast in plaster and trimmed by the craft of the glassblowers. The "stuffed" field mouse peeks from under a hedge made of wrapped-wire twigs, covered with pressed leaves, and glass berries. On the other hand the tawny tiger appears as in life, stalking the invader from the depths of a jungle that has been built piecemeal in the unseen shops of the institution from materials gathered within a radius of a few city blocks from its doors.

SHELF IN PULLMAN "UPPER" REPLACES HAMMOCK

Collapsible shelves of webbing are being installed in upper berths of Pullman sleeping cars to replace the hammocks, where the occupant can place bags and suitcases at night. Heretofore, storage space was available only in the lower compartments, but with this new equipment uppers will have the most room.

Preserved Leaves and Petals Guide the Artist in Assembling Glass Flowers

Drawn to Thinness of Tissue Paper, the Crystal Is Delicately Curved into Blossoms

More Lasting than Nature's Own, the Artificial Plant Lacks Only Scent

Tinting Blooms with a Perfection That Might Beguile a Passing Bee

Unfinished Copy of Cannon-Ball Tree That Was Taken Piecemeal from Its South American Soil: Perishable Parts Were Preserved and Branches Tagged as They Were Cut from the Trunk

ARTIST IN DIVING SUIT PAINTS SEA'S DEPTHS

Fish like birds, and castles of coral, have been painted by an artist who, with weighted palette and a diver's helmet, has walked through the tideless lagoons of the South Seas amid forests of seaweed. In this land beneath the water, the sea is like the air itself, and is no more visible than is the atmosphere on the surface of the earth. There is no crystal clarity in the stillness below, however. On the canvas, cliffs rise sheer, mountains seem to jut at a vast distance and, in one scene, the sky stretches behind a great peak, a horizon line which is, in fact, a beach cutting across the watery heavens. The painter's work under water is done on calfskin, although prepared canvas will do. Fish swim about the artist while he is at work to catch the bits of detached paint. Some of these sea denizens are dangerous, among them being the tiger shark, who likes the bright, clear, lime-bearing water where rise the graceful coral colonnades. Then there is the octopus. When the smaller fish vanish, his presence may be suspected. Another menace is the ray, giant cousin of the stingaree, which lurks in the open. Fifteen feet across is his measurement, without his tail. He can sting, but his weapon is his weight—a ton and a half. He crushes his victim by descending on him.

FOUR LAKE TROUT TIP SCALE AT TWO HUNDRED POUNDS

Lakes in Alberta, Canada, almost untouched by the angler, abound in game fish of unusual size. Four lake trout

Catch of Four Giant Lake Trout That Weighed More than 200 Pounds

caught in nets in Cold Lake tipped the scale at 211 pounds. Though they were large, specimens of equal weight are occasionally taken, and according to sportsmen, Lake Athabasca, also in this province, holds many hundreds of thousands. In order to prepare catches for market, a large fishery, the most northerly situated commercial cannery in Canada, has been erected on the shores of Lake Athabasca.

CORAL ISLAND OF SOUTH SEAS BUILT BY TINY ANIMALS

Tiny sea animals that build up coral reefs and islands are solely meat-eating creatures, according to a scientist who recently investigated their habits. In the experiments, corals persistently refused vegetable diets, but even water fleas were not swift enough to escape them. When offered beef juice or small bits of meat, the tentacles at the outer edge of the colony first appeared, and, as the stimulus was transmitted to the other members, the surface of the specimen opened out like a flower. At the rate of growth observed, it would require one species 6,531 to 7,620 years to form a reef 150 feet thick.

CORNSTALKS MADE INTO SIRUP FOR COOKING PURPOSES

Manufacture of excellent cooking sirup from cornstalks is practical as a cannery product, according to the recent announcements of scientists whose conclusions are based on two years of experimental work. Clear reddish amber in color, and of pleasing flavor, the sirup is extracted by a process similar to that used in making sorghum. Stalks are allowed to stand in the fields 10 to 20 days after the ears have been removed to increase the density of the juices.

In Painting the Wonders to Be Found under the Sea, Artist Risks Life in Diving Suit, and Escapes After Encounters with Sharks and Other Monsters of the Deep

CAMERA MEN RISK THEIR LIVES IN "SHOOTING" PICTURES

Risking their lives to obtain good pictures is part of the routine day's work of

Suspended by Giant Pulley, Hundreds of Feet Above Earth, Photographer Snaps "Airplane" Views

newspaper and magazine photographers. Swinging at the end of a crane a hundred feet or more in the air, climbing over the girders of an unfinished skyscraper with only metal and concrete below to break a fall, and dashing through flames and smoke at a big fire, are some of the tasks demanded of them. When Mt. Etna recently gushed forth tons of hot stone and ashes that enveloped the surrounding territory and routed inhabitants of near-by villages, picture-service men rushed into the area and ascended almost to the very mouth of the fiery crater. Even though the intense heat oppressed them and molten lava flowed about their feet, they remained at their posts until they had "shot" a lengthy record of the eruption.

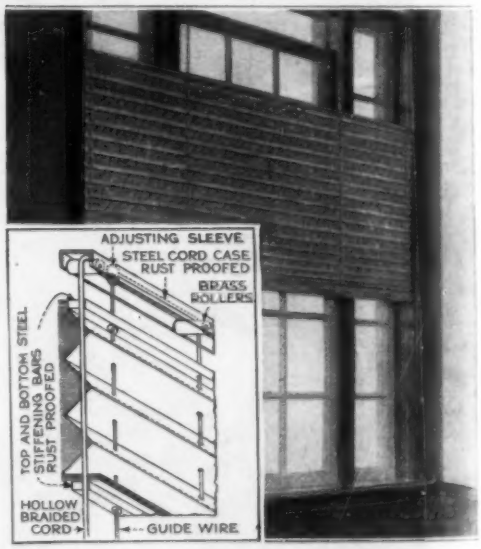
¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

ORANGES GILDED BY SCIENCE TO RIVAL NATURE'S HUES

In less than a week, the green color of early picked oranges, which are suitable for eating, is changed to the characteristic golden tint by the action of fumes from gasoline and kerosene. Instead of waiting from four to six weeks for the sun's rays to accomplish this, growers now get their products to market quicker and obtain higher prices. The risk from unexpected frosts also is reduced. If left on the trees, the fruit deteriorates, yet in the mind of the consuming public a green-colored orange is unfit to eat. This led to the perfection of the process of utilizing the vapor to do the work of nature, without in any way injuring the fruit.

WINDOW SHADE RUN ON WIRES TO REPLACE AWNINGS

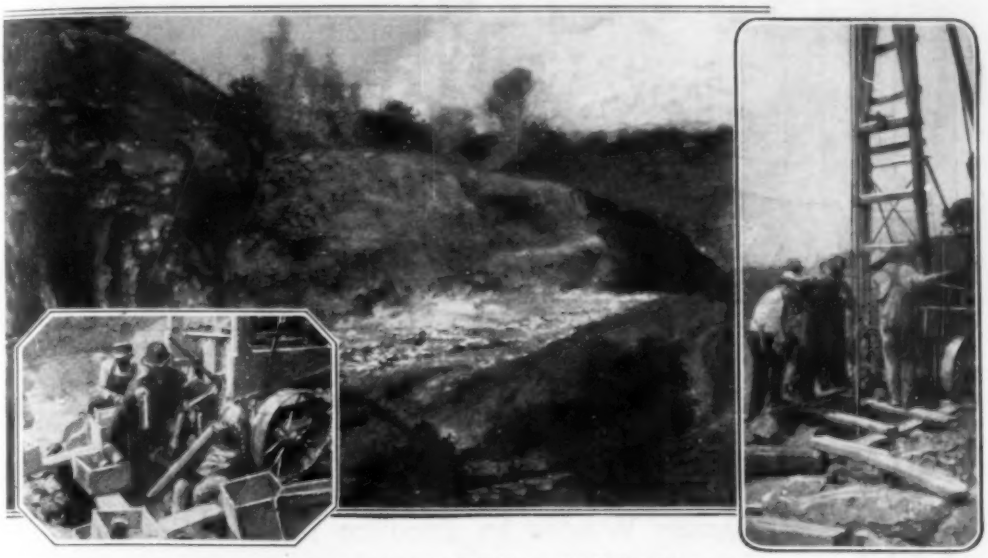
Running on guide wires at each jamb, a window shade is being used that is intended to eliminate the need of awnings as a protection from the sun. Lowered from the top or pulled up from the bottom, the covering can be adjusted to any portion of the window necessary to exclude strong light. Fastened securely at its outer edges, it cannot be blown about by the wind when the sash is raised.



Adjustable Window Shade and How It May Be Used to Replace Awnings

To do away with glare, a special material, which is said to be proof against water stains also, is used in its manufacture.

HILLSIDE SHATTERED BY ONE DYNAMITE BLAST



Sixty Thousand Pounds of Dynamite Crumbled the Hillside on the Valley Floor. Left: Lowering the Charges into Place; and, Right: Drilling 150-Foot Hole Through Solid Rock

Tearing away a huge section of a hill of solid stone, 60,000 pounds of dynamite, placed in 70 holes bored in the face of the hillside, were exploded recently almost at the same instant by a single impulse from a blasting machine. A second after the electric switch was thrown, setting off the explosives, the great mass seemed actually to melt into a river of dirt and rocks, spreading about the base of the hill. More than 250,000 tons of stone were hurled into the air, an amount estimated as sufficient to meet the demands of the quarry for a year. One of the holes bored for the blast, said to be one of the largest ever set off, was 150 feet deep.

CAMELS TAKE HORSES' PLACE ON RUSSIAN FARMS

Peasants in some districts of Russia are importing camels to take the place of horses in the regular farm work, according to recent reports. These animals are desired, it is said, because they will eat almost anything and thrive. Difficulty is experienced in transporting them, however, as the desert beasts of burden can be persuaded to enter a freight car only with the greatest difficulty. Some of the farmers are using their cows for draft purposes, but incorrect handling is said to ruin them for milking.

METEOR IS CAUGHT BY CAMERA IN FLIGHT ACROSS SKY

By chance, an amateur photographer recently obtained a photograph of a meteor as it sped through the heavens in a blaze of fire. A high-school student in a central-western town had set up his instrument to take a time exposure of the school building at night. While the shutters were open, the celestial visitor flashed within range. When the film was developed, the path of the body was clearly defined, as well as its reflection.

Flight of Fiery Meteor and Its Reflection Caught by Camera Exposed for Night Picture

¶ About 7,000,000 acres of forest land in the United States are burned each year.

Mystery of "Woven Wind" Has Echo in Silkworm Culture in U. S.

Barren Wastes to Produce Million Cocoons

AIDED by a highly developed system of irrigation and a climate that has proved ideal for the purpose, silkworm culture has invaded the barren, arid lands skirting the foothills of the Sierras in California. On 800 reclaimed acres, 150,000 mulberry trees, on which the silkworm feeds, have been raised. Already about a million cocoons have been grown, from which about three bales of raw silk have been marketed by the producers. The silkworm is an aristocrat that demands little attention after feed and climate have been provided.

The history of silk goes back to the days of rich romance in the celestial kingdom of old China, where, first called "woven wind," its discovery was the result of a woman's curiosity and genius. Twenty-six hundred years before Christianity, Si-Ling, the wife of a famous emperor, noticed that tiny worms wove a mysterious thread, delicate and glossy, and wrapped themselves in balls of it. She collected a large number of the worms, fed them, and became the "Goddess of Silkworms," the mother of a most interesting industry.

It was not until the barnyard hen was made to feel at home that she became a profitable egg producer. This is also true of the silkworm. For many centuries man has studied to increase its output and quality of silk with the result that today in comparing the worm with its wild ancestors it is found that both the little creature and its moth have become much larger. But the moth has lost its power of flight and its color has changed.

The egg of the silk moth is nearly round, and about an eighth of an inch in di-

ameter. When laid it is yellow, but, if fertile, will change in a few days to a bluish gray. From one ounce of eggs about 40,000 worms are hatched. In their first stage these will consume approximately six ounces of mulberry leaves, but in the final stage they will devour over a thousand pounds.

The baby silkworm has a dozen rings that seem to compose its body, some sixteen legs, and nine black spots on each side, which are really holes through which it breathes. Its eyes are imperfect and it must depend almost entirely on the sense of touch to guide it along the leaf.

Each cocoon contains about 600 yards of thread so fine that it would take almost a thousand miles of it to make a pound. After they are gathered, the cocoons are placed in basins of soapy water, where a gluelike substance is soaked from the filament. Then they are beaten and swirled around with a small whisk broom to unravel the ends. These are caught on the broom and combed together, then they are passed through an eye in the edge of the basin, fastened to a reel, and wound into a "skein." The silk is of beautiful luster and is the strongest known fiber, in its raw state, in the world.

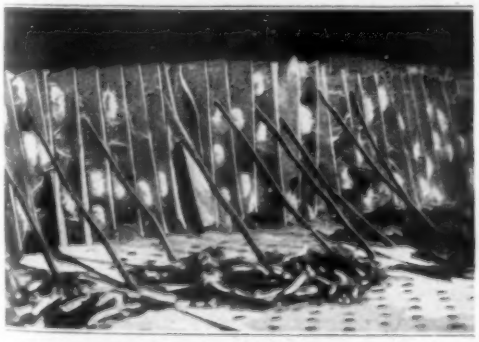
Above: Feeding Silkworms with Mulberry Leaves. Below: Hatching Oven

Child Worker of the Orient Unwinding Cocoons

In the manufacture of silk it often must pass through more than 150 operations in the mill before it assumes the gorgeous richness that marked it in the long-ago, raiment of emperors and gods. For printed silk the designs are first sketched on white paper, after which they are engraved in zinc. Then each color pattern is etched on a separate copper cylinder. The cylinder is placed on the printing machine which supplies the etchings with various shaded dyes, before passing over the cloth.

Where the designs are to be woven in the finished product, large machines equipped with delicate "fingers" that guide each separate strand of yarn, knit the threads and loop them as they are carried across the loom and back and forth by busy little shuttlelike devices. The design is regulated by a pattern wheel that controls the different-colored threads as they are woven into the body.

Although silk is a gift of the Orient, the



Before the Moth Can Cut the Tender Strands the Worm Must Be Killed in the Cocoon

Japan First Learned the Mystery of the "Woven Wind" from Chinese Girls Sent by Their Emperor to Teach the Art of Silk-Making to the Peoples of Old Nippon

art of the chemist has succeeded in imitating it with a fabric capable of being dyed and rendered as attractive to the eye as any coming from the silk makers of the East.

Where the worm eats and digests the green leaf of the mulberry and squeezes it out in delicate threads as a spider spins its web, the machine reduces vegetable matter, chiefly wood pulp, to a liquid condition and then strings it into thin filaments through microscopic spinnerets in much the same manner. The silkworms must first be killed in the cocoons as they lie in bowls of water, but the manufactured silk is wound directly on reels as it comes from the mechanism that creates it.

Neither silk can be told from the other without a careful chemical examination. Even the strongest microscope fails to find any characteristics by which the difference can be definitely identified. The research laboratory of the Laundryowner's National Association, after long experiments, found that by proper methods of handling, artificial silk can be laundered without any danger of impairing its ability to withstand the wear and tear that its older rival can weather with apparent safety.

Silk was first brought from the unknown East to European courts by way of ships and caravans of Oriental merchants. Its rich sheen and soft caressing texture, combined with the depth and wealth of color it takes from dyes, and its jewellike play of light and glowing shadow, literally hypnotized the courtiers who were fortunate enough to gaze upon it.

With its introduction to the western world the Asiatics were called upon to increase the output. The result was that every available worker in the silk-growing countries was called upon to labor from dawn until sundown unwinding the glittering threads from the cocoons. Now, with the chemically made article equal in almost every respect to the natural filament, it is believed that this trade pressure has been greatly relieved.

The California cocoon products are rated as equal to some of the "extra classical Italian" grades, and a single cocoon unreels as much as 1,300 yards of silk. There the mortality loss of worms has thus far been inconsequential, while in non-irrigated sections of Asiatic countries such losses range from 30 to 40 per cent. The absence of rain during the worms' silk-making season is held to be advantageous for the industry, and the contrasting humidity of neighboring bay regions along the Pacific coast is said to be ideal for spinning and weaving.

HUNTERS SNOWSHOE OVER MUD TO STALK SEA GAME

Skis and snowshoes are used by fishermen and hunters on the islands of the North Sea to enable them to walk over

Skis and Boards Being Used as Snowshoes to Walk over North Sea Mud

the wet and slippery mud that covers the ground most of the year. With these it is possible to travel miles over the soggy ground, inhabited by sea-dogs and water fowls, much of which otherwise would be impassable. First the natives strapped big wood boards to their feet, but later it was found that the footgear used to traverse the snowdrifts was more efficient.

TURTLES AND ANGLEWORMS BECOME "FARM CROPS"

Supplying turtles and fishworms to an eager market keeps two residents of a southern state busy, and provides for them a profitable source of income. In a large frame shack, which the owner calls his "terrapin farm," thousands of the diamond backs are raised and sold for as much as $100 a dozen. Angleworms by the wholesale are produced in a few square feet of earth, and the "breeder" is reported to have cleared $20,000 in this unusual line of industry. He ships them to fishermen all over his state, and even to east-coast cities. To meet emergencies, 10 gallons of them are kept on hand at all times.

¶ Persons living on rural routes are asked by the postmaster-general to paint their mail boxes white, with the name of the head of the family in black letters.

PHOTOGRAPHIC GUNS OF NAVY SHOOT AT SUN'S ECLIPSE

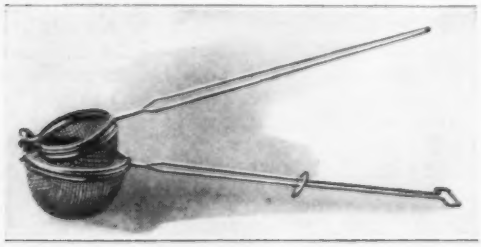
In modern naval operations, the camera has come to figure almost as prominently as the torpedo and the 16-inch gun. From

Camera "Guns" of Navy Used to Check Up Gunfire and in Making Maps

the impressions it records, shell fire and projectile velocity are partly determined, two most important factors in accurate gunfire. It also provides a means of obtaining authentic maps of territory during maneuvers. Both still and motion pictures are used. In the recent naval practice off the Atlantic coast, high-speed cameras caught the flights of bombs loosed from airplanes at targets floating on the sea. During the eclipse of the sun recently, a naval photographer ascended 15,000 feet in a plane to take pictures of the event with a special aerial camera, making, according to scientists, the first time such a feat has been attempted.

FRYING BASKET FORMS CUP OF SHREDDED POTATOES

Shaped like birds' nests, small cups to serve vegetables and other foods are made



Double Fryer That Forms Shredded Potatoes into Cups for Serving Other Foods and Vegetables

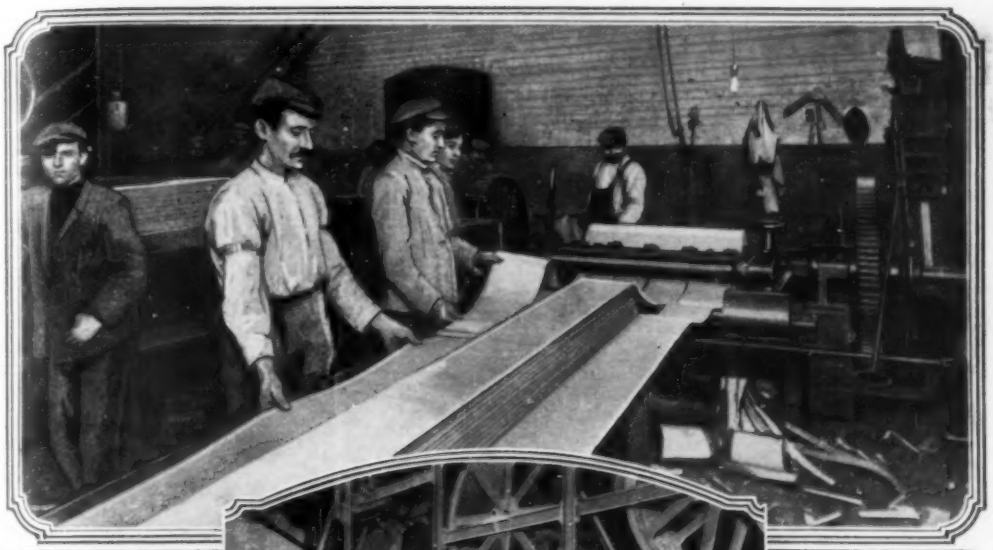
of potatoes with a double frying basket now on the market. After being peeled, washed, and cut into shoestring shape, they are put into a small wire container that looks like a strainer. Into this a smaller basket presses, the two being held in place by a metal ring slipped over the handles. When fried crisp the shredded vegetable forms a cup that has the appearance of a bird's nest.

FIVE BILLION MATCHES DAILY SUPPLY FOR WORLD'S NEEDS

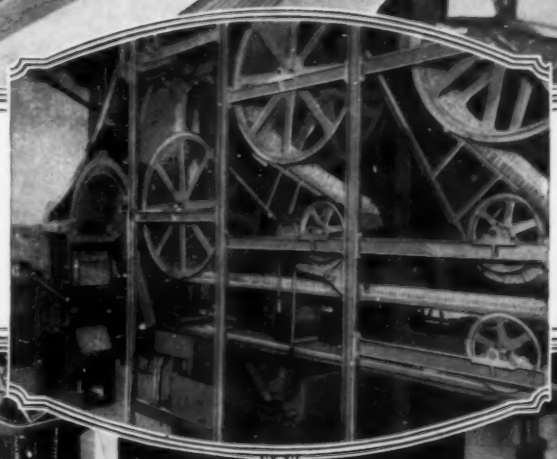
With the recent announcement that the world uses five billion matches every day, or about 2,000,000 million a year, attention is called to the fact that hand labor in these factories has been discarded for machines in order to meet the demand. Hauled from forests by trains, poplar, linden, and willow trees are cut into logs 16 to 36 inches in length, by power saws, and softened in boiling water. Run through veneering machines, these pieces are shaved into ribbons, as thick as a match and as wide as the logs. Each turns out splints for 10 to 17 million matches in 10 hours. These strips then travel through machinery that shapes them, and into another apparatus which dips the tips in the flame-producing compound. In all the process of manufacture only the packing is done by hand.

ARMFUL OF "JUNK" FORMED INTO CARTOON FACE

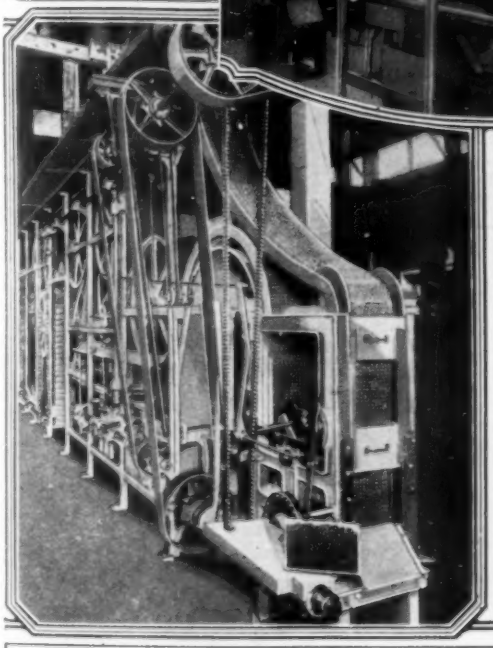
As a kind of initiation test, each student entering on the course at an art school in Germany is given an armful of rubbish and told to "make the best of it." Recently, one scholar carried out the instructions by forming his allotment of cast-off material into a queer face. On a piece of thin board he fastened a funnel for a nose, curled a spiral spring for eyes, and then bent its ends down for the outline of the head. Steel shavings served as hair, a sheet of perforated metal gave "color" to the cheeks, and an old stove brush took the place of the mouth. The background for the cartoon was furnished by a feather duster.



Above Are the Thin Flexible Ribbons of Match Wood Unwinding from the Log as It Turns Against a Knife That Presses Inward with Each Revolution. The Strips Then Go to the Stem Machine



Left: Matches by the Million Stood on End and Firmly Gripped in a Conveyor Belt, Travel over Wide Pulley-like Wheels in Their Route Through the Mechanism Which Has Created Them

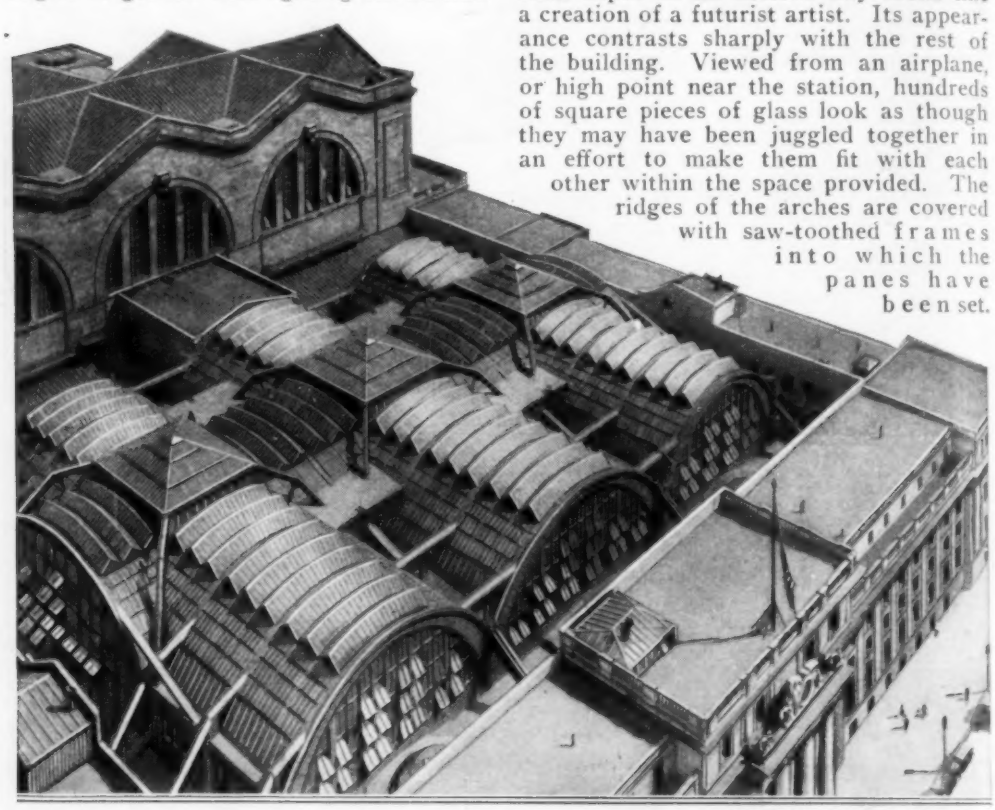


Left, Matches Passing from the Machine after Receiving Their Dips in the Composition That Gives Them the "Fire Heads": Right, Drying Racks and Ovens Where the Tips Are Hardened

Copyright, International News Service

GLASS ROOF ON DEPOT LIKE FUTURIST PAINTING

Framed in high arches and narrow angles to get the best lighting effects and drainage, part of the roof of a big railroad depot in an eastern city looks like a creation of a futurist artist. Its appearance contrasts sharply with the rest of the building. Viewed from an airplane, or high point near the station, hundreds of square pieces of glass look as though they may have been juggled together in an effort to make them fit with each other within the space provided. The ridges of the arches are covered with saw-toothed frames into which the panes have been set.



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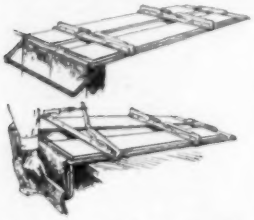
Resembling a Cubist Painting, This Glass Roof over a Railroad Station Is Designed for Drainage as Well as to Transmit Light to the Interior of the Building

TROUSERS ARE KEPT IN SHAPE BY PRESSURE ON BOARDS

With only two levers to open and close, a press and stretcher has been patented that will keep from one to five pairs of trousers in good condition. Rapid in operation, the pressure can be varied by a simple adjustment. Also the boards need not be lifted off when it is desired to remove one of the garments.



More than 17,000 miles of wire are contained in the fire-alarm systems of Manhattan Island, New York.

WASTE AUTO OIL TO HELP SOLVE HEATING PROBLEM

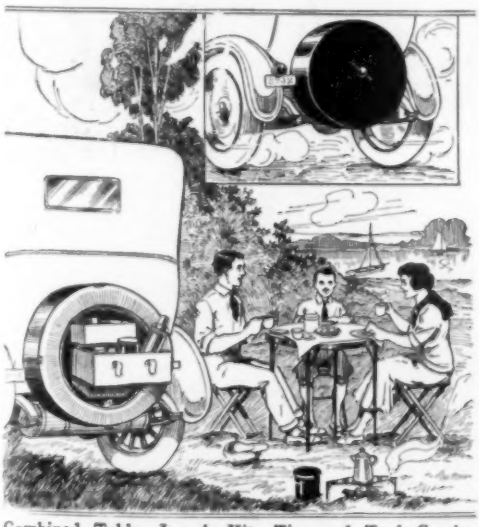
Heating houses with waste oil periodically drawn from automobile crank cases may soon be a means of helping solve the fuel question, in the opinion of experts. Already garage owners in an eastern city are mixing this worn-out lubricant with fuel oil and burning it to heat their establishments. Experiments are now under way to determine the possibility of using this refuse in oil burners for dwellings. In one state alone, it is estimated fifteen million quarts of this substance, equivalent to 15,000 tons of coal, are thrown away yearly. Gasoline itself once was a leftover product, but with the coming of the auto its consumption increased until in 1922 more than sixty billion gallons were used in the United States alone.

HAIR NETS SO FINE MACHINES CAN'T MAKE THEM

Owing to the fine texture of human hair and the shortness of the strands, no machine has been invented that can knit delicate hair nets, so they must all be made by hand, says an eastern manufacturer. More than 95 per cent of the world's supply of this article is produced in the native homes of northern China, from where the hair is first shipped to the United States to be dyed and made sanitary by chemical process. It is then returned for knitting into nets. The strands are tied end to end to form one long string. This is wound on a shuttle which is worked round a bamboo stick or bodkin. The knots are fastened similar to those in fish nets and hammocks, and require skill created by years of practice. One net an hour is considered to be a good average for the ordinary worker.

LUNCH KIT, TIRE AND TOOL CARRIER ARE COMBINED

Camp table, lunch kit, tool and tire carrier are combined in one automobile accessory patented by a western man. Just a little larger than an ordinary casing, a cylinder-shaped, all-metal case provides a waterproof space for the spares, and is divided into three compartments. A drawer, insulated with cork, serves as an

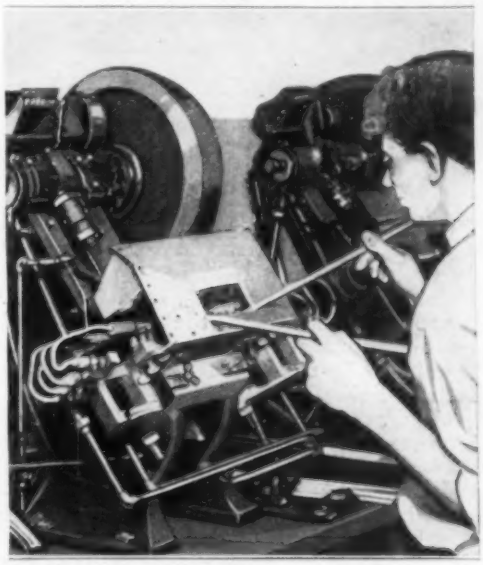


Combined Table, Lunch Kit, Tire and Tool Carrier That Is Weather and Dust Proof

ice chest for keeping food cool. A close-fitting cover keeps dust and rain from the contents, and also serves as a table top.

GLASS PULLED OUT LIKE TAFFY FOR PHONE SIGNAL LIGHTS

Stretched and pulled like taffy, glass is formed into rods from which colored glass caps for telephone signal lamps are



Copyright, Western Electric Co.

Feeding Heated Glass Rods into Press That Stamps Out Caps for Telephone Signal Lamps

stamped by punch presses from glowing rods. Red glass is made by dissolving a bit of gold in the "melt," green is produced by adding copper oxide, while opalescent contains bone ash. Set in brass rings, the different colored bull's-eyes tell the operators how to "put through" the calls.

VOLCANIC ASH KILLS DEER

Reindeers in the government's herd at Port Heiden, Alaska, have been killed by volcanic ash, erupted from a peak, that covered their feeding range to a depth of an inch and a half. Stirred by the hoofs of the animals, the debris caused acute lung and throat trouble and wore away the hair and skin from the lips, resulting in sickness and often death. The herders suffered also, but none of them died. An attempt to move the deer across the Alaska peninsula to a better forage ground was finally abandoned.

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Yuletide Candles Undergoing Inspection before Packing

Xmas Candles and How They Are Made with Machines By the Millions

SO great is the demand for Christmas candles, that the business of making them represents a year-round industry. More than one half of the entire product of the factories engaged in making them is said to be composed of these yuletide festival lights.

Candles are one of the earliest forms of illumination known to man. History shows that even in the time of Moses they were extensively used, being mentioned in connection with the required ritual of the temple. Among Greeks and Romans they were the natural outgrowth of the flambeaux or torches made of wood soaked in oil.

Those who make candles say that there are more of all kinds used now than there were in the colonial days, when the people had no other source of light. It once was an annual event in the rural districts to see the members of a family gathered together on the long winter evenings making tallow dips in a metal utensil.

Formerly made of beeswax or animal fats, these materials still enter into the composition of candles in varying degrees in the big factories which have relieved the household of their manufacture. Now, machinery is almost entirely employed to produce them, and to this step has been added a brilliancy of color which suggests an oriental gorgeousness.

Modern candles do not smoke as did those of the pioneer days, which required the constant application of snuffers. By drawing one strand of the wick tighter than the others, the candlemaker of today causes the wick to bend while it burns, coming into more direct contact with the air and consuming evenly.

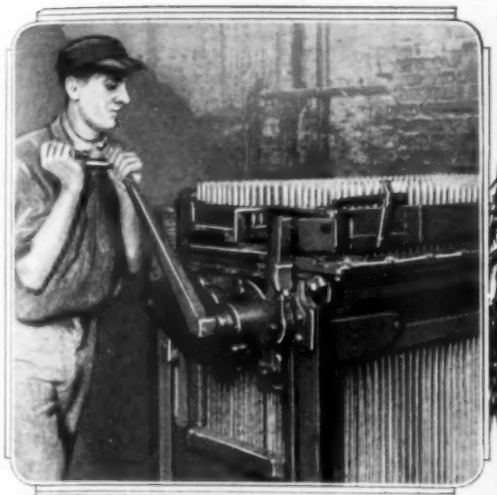
The manufacture of the Christmas-tree candles begins the day after the holiday and continues throughout the year. These are made of wax which has first been colored. The twisted-rope effect is produced by turning them through molds much in the way a screw is twisted into a piece of wood. They are then sorted and packed by a machine that drops the different colored ones into separate bins from where they slide down to an inspecting platform and are put up in cartons.

The yuletide candle is a large affair, about three and a half inches in diameter. The color is a beautiful red, effectively worked in holly and other holiday greens which are also of wax. According to the old custom these are to be lighted and left in the window to burn all night long on Christmas Eve. Modern usage also has given them a place on the mantelpiece and as part of table decorations for the Christmas feast.

Not all the candles made at the present time are used as decorations, however, as those in greatest demand are for miners. The men working in the depths of the pits where open lights are permitted, prefer the candle light as being better adapted to revealing the characteristic colors of the ores that bear precious metals.

Many candles also are manufactured in large quantities for other feasts and seasons observed throughout the civilized world, and as ornaments to the home.

"Banquet" Candles Get Their Brilliant Shades from Careful Dipping in Colored Wax



Each Rack of Candles Is Moved Upward and the Next "Set" Is Poured

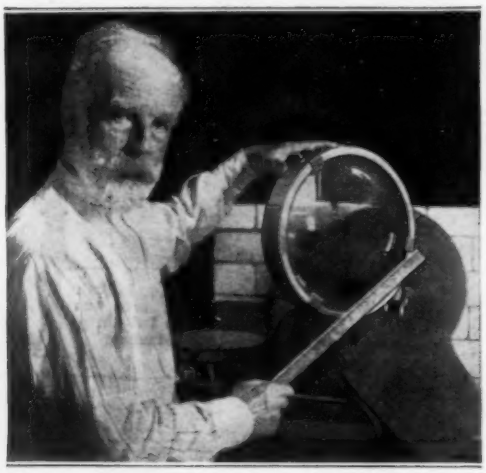
Pouring Molten Wax into the Molding Machine

Better-Grade Candles Are Wiped Clean and Tested in the Boxing Room

Colors Are Automatically Separated and Delivered to the Packers

FIRST TWELVE-INCH LENSES MADE FROM U. S. GLASS

Measuring 12 inches in diameter, the largest lenses ever made of U. S. optical glass have been completed by government scientists. Throughout the delicate process of grinding, an expert stood by the craftsmen to supervise the work, since even the slightest error in measurements is irreparable. Fashioning the lenses is done by curved instruments that scour emery across their surfaces. At first the grit is coarse, but, as the job progresses, finer quality is used, until the desired shape and thickness have been obtained. Polish, upon which clearness depends, is put on in the same way, and, on the more powerful lenses, it is so sensitive that the slightest finger touch will blur it. Although a lens may pass through the hands of several men before it is completed, it comes from the last as a perfect product, so skillful are the workers. Instruments that measure to a thousandth of an inch, or less, are used.



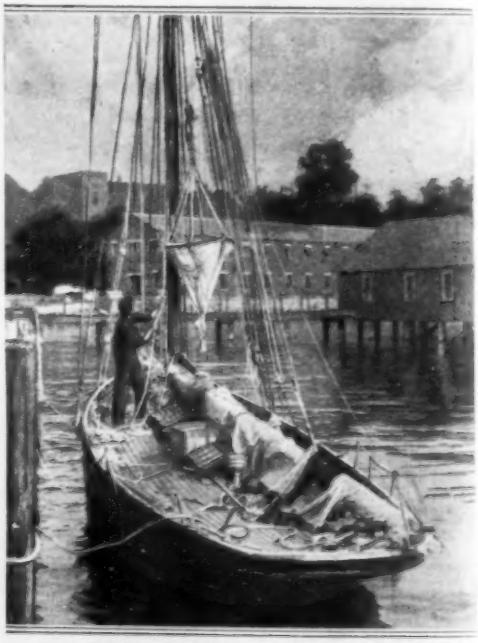
Big Lens Constructed by Government Scientists from Glass Made in the United States

MARS TO APPROACH THE EARTH CLOSE ENOUGH FOR STUDY

On August 22, 1924, the planet Mars will be nearer the earth than at any time in the past 120 years, and closer, say scientists, than it will be again during the present century. Its expected approach has caused observers to prepare plans for making a study of it at short range. Throughout August and September of next year, this celestial neighbor will hang like a great lantern in the southern skies and, it is said, will rival Jupiter in brightness. In the opinion of one authority, little can be done regarding communication with possible inhabitants of the planet, although many believe that it shelters intelligent life. Another holds that the "canals" that traverse the sphere are neither water channels nor vegetation growing along such courses, but are plants springing from moist ground or banks of damp soil, since there is no known solid in the mineral world that darkens as these spots do and then fades out in sunlight.

ACROSS OCEAN SINGLE-HANDED IN TEN-TON SAILBOAT

Alone in a 30-foot, 10-ton racing cutter, a French adventurer recently crossed the Atlantic Ocean and part of the Mediterranean Sea, arriving in New York on the 142d day of his journey. He is said to have established a record for such a small craft. During his voyage, lasting a little more than four and one-half months, he met with three hurricanes, when huge seas threatened to swallow him and his boat, and was unconscious for 48 hours when he was stricken with fever. Near the end of his trip the supplies ran low and he was forced to subsist for several days on a single cup of water. In all, he traversed 5,600 miles.



Ten-Ton Boat, and Adventurer Who Crossed the Atlantic in It Single-Handed

RADIO CODE IS TAUGHT TO SLEEPING STUDENTS

Sending Wireless Messages to Student-Operators at Naval Training Station While They Sleep: This Has Been Found an Aid in Teaching Them the Code

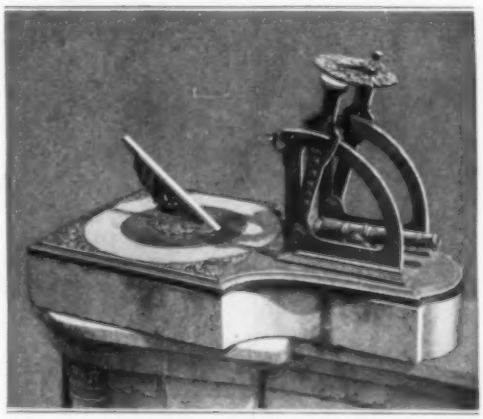
Sending wireless messages to novices while they sleep, to teach them how to send and receive, a method recently adopted at a naval air-training station, has proved a success, according to recent reports. Before dozing off, the students put a set of receivers over their ears. An operator then broadcasts to them, usually at a rate faster than each is capable of copying. In their conscious hours, the amateurs can equal that speed, it is said, while some can even repeat from memory whole texts transmitted to them during their slumbers.

HAIRCLOTH IS THING OF PAST

Gradual discarding of haircloth furniture has forced an eastern factory that manufactured this product to close down after 67 years of operation, according to reports. Formerly the company employed 400 persons, but in later years, with the change of customs, the demand for this fabric fell off until seven persons were able to keep the trade supplied. Now the plant is to be dismantled.

SUN'S RAYS MAKE ALARM CLOCK OF CANNON

Sunlight is called upon to inform the residents of a community in southern Europe when high noon has arrived, by setting off the charge in a cannon. Fixed to the piece is a small lens that focuses the rays on the touchhole of the gun in such a way that they do not reach the powder until the sun's position is directly in line with a tiny opening. The supports of the "alarm" are arranged to adjust it to the light beams at the same time every day of the year. Often the device fails to work because of cloudy skies that prevent sufficient heat from reaching it to ignite the explosive. The hours are indicated on a clocklike dial.



Cannon Automatically Fired at High Noon Each Day by Powerful Rays of Sun

Behind the Scenes at the White House

President's Home Guarded by Protective Devices, Including Fire Escapes on Roof that Look Like Small Cannon

MILLIONS of visitors from all parts of the world have made pilgrimages to the White House at Washington, but few of them have ever inspected any of its mechanical marvels.

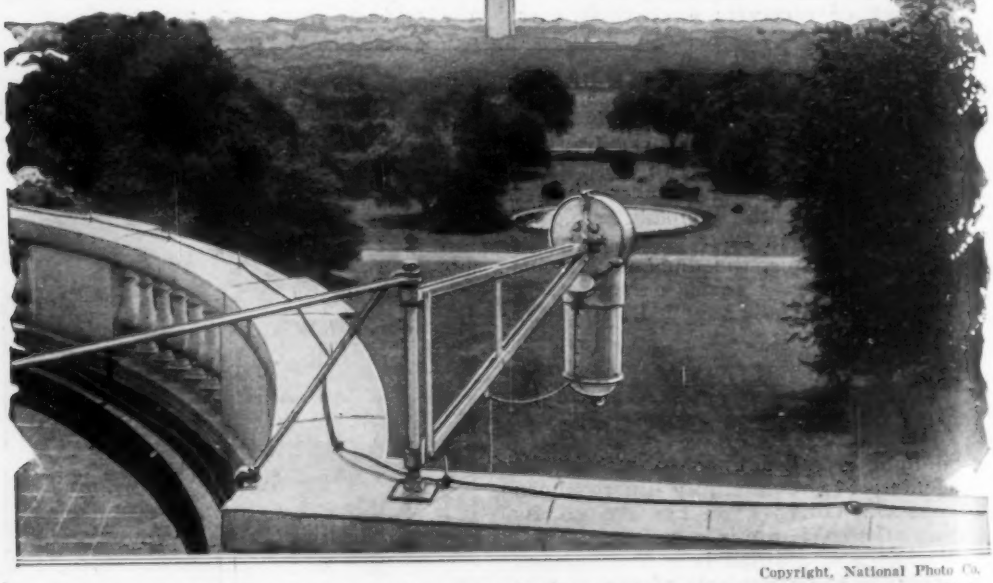
Although neither lightning rods nor fire escapes are visible from the outside, they are there just the same, but in such strange forms that they would hardly be recognized, even if seen. The fire escapes, for example, look for all the world like miniature howitzers mounted on the roof of the executive mansion for the defense of the famous edifice. Weighing 200 pounds apiece and anchored from a balcony by means of extendable steel arms, the metal drums would never attract the attention of anyone hunting for steel ladders, safety ropes, or exit elevators. Pulling the chain at the bottom of the cylinders causes them to open and release an endless chain that fastens around the waist and then slowly lowers the load to the ground.

Science has also armored the White House against the dangers of lightning, approximately 2,500 feet of wire being strung across the chimneys and guard wall on the roof. The arrangement is such that if any balls of fire are flung from the skies, the lightning wires deflect them into the ground. Then there is an attractive, screened, sleeping porch. This skyline bedchamber, however, is not for the use of the president. It is 18 feet square and was erected exclusively for White House attendants.

Another prominent accessory on the roof is known as the president's flagpole and is used wholly for the display of "Old Glory."

A mammoth lamp which is six feet high and two and one-half feet in diameter—a large man can stand erect within it, as he cleans the globe—is the faithful beacon which illuminates the main entrance to the mansion.

Migratory and native birds by the hundreds frequent the White House forest, consisting of more than 200 trees of about 65 different species. Birdhouses on poles as well as swinging shelters have been provided for feathered visitors. Even the comfort of the policemen who guard the president is well looked after. Cubbylike houses, heated electrically during the winter are provided at the entrances.



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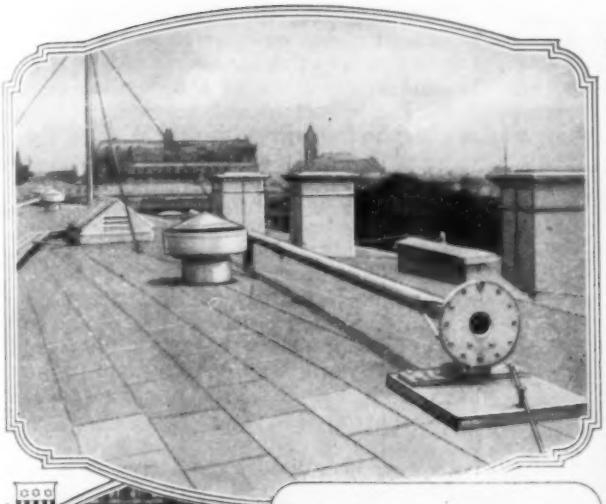
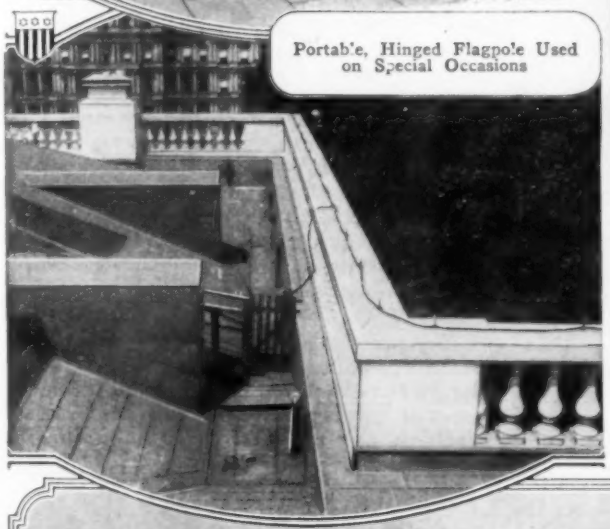
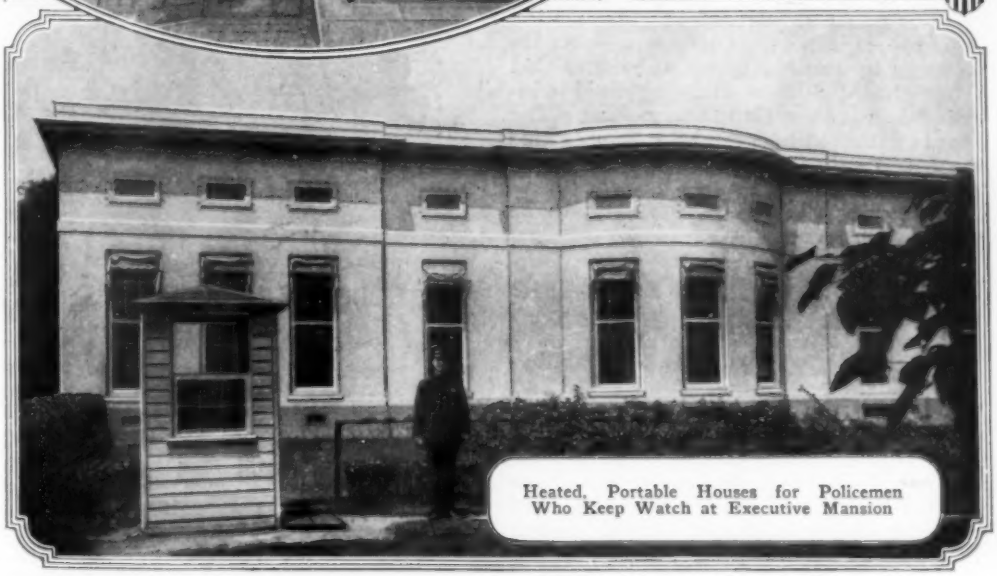
Fire Escape on White House Roof that Can Lower Five Men to the Ground Simultaneously on Endless Chain, If Flames Should Threaten Executive Mansion



Portab'e, Hinged Flagpo'e Used on Special Occasions



Mammoth Lamp, Suspended from Portico at Entrance to White House, in Which Large Man Can Stand Upright, and, at Left, Wires Which Are Strung Along Roof and Pass over Sides of Building to Guard Against Lightning



Heated, Portable Houses for Policemen Who Keep Watch at Executive Mansion

Copyright, National Photo Co.

In the basement, however, is an old veteran of early-day mechanics—a huge extendable metal arm which could be swung in place above the open fire so that the pots and kettles in which the presidential dinners were cooked could be hung on it.

Two large marble troughs in another basement room, now used as a coal cellar, take us back to the days when this particular room was used as the White House dairy. The marble vats were used for cooling and storing the milk.

WHIRLING BRUSH AND VACUUM TAKE DIRT FROM CLOTH

Clothing and other fabrics can be cleaned by a renovator that has a vacuum

Clothing Renovator That Draws the Dirt from the Fabrics with Revolving Brushes and Vacuum

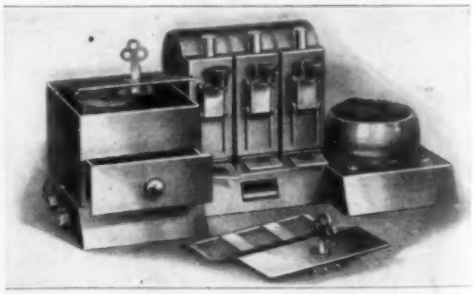
device to draw air through them while a revolving brush, protruding through the table top, agitates the surfaces. Spots are removed by another wheel of bristles that is moistened with a cleaning fluid contained in a tank within the machine. The dust is gathered in a chamber, from which it can be easily taken. Any kind of liquid may be used for the cleaning, as the device is practically all metal and is said to be proof against fire.

MODERN PALACE ON ROOF TOP RIVALS BABYLON'S GARDENS

Rivaling the wonders of ancient Babylon's hanging gardens, a million-dollar home, surrounded by grass-carpeted and ornamented grounds, studded with trees and shrubbery, has been erected on the roof of a New York skyscraper. Far above the din of traffic, this domicile reposes in a setting similar to that of a country villa. Three feet of earth has been found sufficient to nourish 15-foot cypresses, vines, rosebushes, and lawns. Rustic benches, flagstone walks, fish pools, and birdhouses add touches of regal beauty to the "estate," which calls attention to the excavations of like works now progressing in Egypt. An exploring party there has unearthed the remains of a "sky garden" said to have been built by Pharaoh Mentuhotep III over a barren cliff of sand and stone near the Valley of Kings. High above the ruler's palace, landscape artists laid out a spacious courtyard. Slave gangs bored a series of holes, into which was dumped rich soil from the River Nile, and sycamore figs, a most imposing tree, were planted. Flowers from the lowlands and the tamarisk were cultivated, according to reports, which state that dried-up forms of these were found in the cavities made by the ancient gardeners.

LOCKED STAMP HOLDER STOPS THEFT AND SAVES TIME

To prevent loss, theft, or misuse of stamps, a container has been designed that issues the exact amount required for packages or letters when its keys are depressed. Holding any number of denominations, it



Automatic "Watchman" that Incloses Postage Stamps and Records Each Withdrawal on a Register

keeps them securely locked in coils, so that there is no confusion. Thus spoilage is reduced. The apparatus automatically records each selection, thereby providing a check on the number actually used.

¶More than 1,000 fur farms are located in Canada.

WOMEN OF WHITE AFRICANS RULE TRIBAL HOMES

There exists in the remote Sahara Desert, among the mountain fastnesses of Hoggar, an Arab tribe whose female members have enjoyed privileges equal to those of the men folk for an unknown number of years. These people, called the Tuarega, while embracing most of the tenets of Mahomet, have disregarded the clauses referring to subjugation of women and permitting polygamy. They are purely monogamic. In this region the fair sex are absolutely independent, marrying according to their own wishes. Their authority as mistresses of the tents is not questioned and they do not wear veils. Inscriptions discovered by explorers indicate that their civilization dates from long ago, but nothing has been learned to credit legends which tell of cities built by these people. The male portion of the communities devote their time to martial exercises.

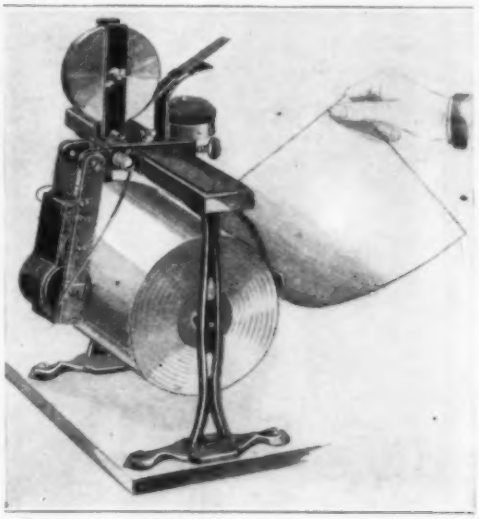
WRIST WATCH WORN AS RING OR HUNG ON NECKLACE

Worn as a ring, a lavalliere, or on the wrist, a tiny watch made by a middle-western jeweler serves three purposes. It can be changed quickly to suit the whim of the wearer. When worn on the wrist, the hinged ring part folds in two sections flat against the back of the watch, forming eyelets through which ribbon passes. Another slight change is made if it is to be suspended on a lavalliere.

Wrist Watch That Is Used as a Ring or Lavalliere to Suit Wearer's Fancy

NAME PRINTED ON WRAPPERS AS THE PAPER UNROLLS

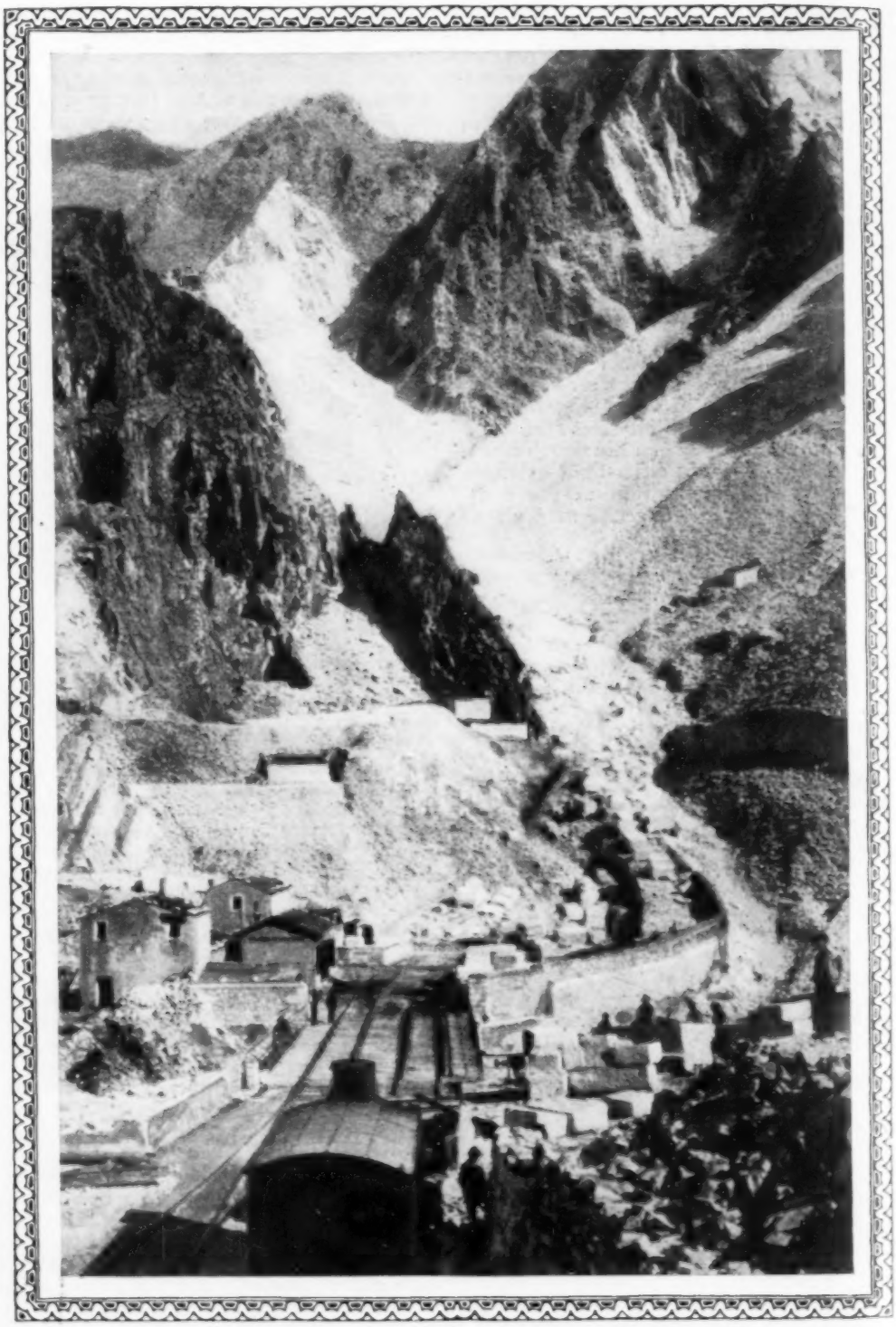
As a means of advertising, shopkeepers are using a device that stamps a name or a design upon wrapping paper as it is unwound from the roll. Thus storekeepers can save the cost of having their names put on at the factory, and can make up their own ads, changing the style and text as often as they wish. Different colors of ink can be employed also. Attached to the frame carrying the paper the printing attachment turns as the former revolves, leaving a neat, readable note on all sheets used. It requires little attention, and can be removed easily.



Revolving Stamp That Prints Ads on Wrapping Paper as It Unwinds from Roll

COLOR CHANGE OF HYDRANGEA BLOOM SOLVED BY TEST

Why hydrangea blooms change color in different localities, a mystery that baffled science for years, has been found through tests to be due to acid in the soil. Some varieties of the plant bear pink flowers one season and blue the next. Often opposite shades appear in those growing within a few feet of each other. Explorers found a species of the growth in China that had blue blossoms, but when these were reset in France they produced pink petals. In Holland, it was formerly rare to find blue ones, while in Germany they were either blue or some tint of red. It is said that with the recent discovery hydrangeas of any desired tint can be grown by simply treating the soil.



While Civilization Was Still Young, the Apuan Alps Surrendered Their White, Marble Masses to the Glory of Art that Graced the Majesty of Old Roman Architecture

In Every Civilized Country Huge Blocks of Snow-White Carrara Marble May Be Seen Awaiting the Awakening Touch of the Sculptor's Tool to Carve Them into Expressions of Beauty

Mining Beauty in Mountain Peaks

More than Million Tons of Carrara Marble Produced Yearly in Apuan Alps of Italy

WITH the completion of a heroic statue of Adam and Eve, hewn by an eminent sculptor to grace the estate of a wealthy American, what is said to be the largest block of Carrara marble ever brought into this country found expression in one of the oldest, and perhaps the most influential of the arts.

Since Roman emperors opened the quarries more than 2,000 years ago, merchant princes of the Middle Ages, monarchs, and the modern world have fashioned their architectural dreams in "Carrara." Only in Tuscany, Italy, is it now to be found in great quantities. More than 1,000,000 tons yearly are being produced in the Apuan Alps, where there is a mountain of glistening stone 5,000 feet high. And despite the fact that centuries of building and art have drawn upon these snow-white deposits for their uncarved beauty, the supply is little more than touched.

Michael Angelo, whose sculptures are among the glories of the renaissance, worked in Carrara marble, Celleni used it, and, since before the birth of Christianity, the quarries have been shipping the matchless stone to all parts of the earth. It is to be seen in the ruins of the Roman forum, at the still well-preserved Arch of Constantine, and beneath the great dome of St. Peter's Cathedral in Rome.

In most places where marble deposits occur, it has become split up in the earth and various substances have filtered into the cracks, giving rise to the colored veins which make it unfit for statuary use. For some mysterious reason the Carrara marbles have remained for the most part free from such disfiguring accidents. In this condition the ancients found them.

Through the neighboring towns surrounding the marble slopes of Carrara are the studios of nearly 2,000 sculptors. In their yards may be seen busts of Indian rajahs, half-finished pieces for merchants in far-off Japan, tombstones for Asia and South America, elephants, polar bears, and other figures from the animal kingdom.

Many methods of transportation are necessary to carry the workmen to the lofty quarries. Railroads, automobiles,

Planed and Polished to Mirrorlike Finish, "Carrara" Reflects Beauty of Ages in Modern Temples of Commerce. Above: Hewn Centuries Ago, the Snowy Rocks Still Lie Amid Ancient Ruins

carriages, donkeys, are used, and an aerial railway suspended hundreds of feet above the earth, below, instant death, if anything should go wrong. The blocks, once they have been loosened, are lifted to rough wooden sleds, under which are soaped rollers, and dragged to the valley by ropes attached to posts. Where the slopes are not too steep, ox teams trudge downward with the huge rocks on creaking carts that leave deep furrows in the snowy dust. By railroad, they are then hauled to the sea, fifteen miles away, where waiting ships carry the immaculate stones to foreign ports.

Seemingly inexhaustible, the quarries can yet be worked for ages. No one knows how far down in the earth the imperishable marble hills extend. Above the level, a majestic range of solid stone mountains rises, towering at points to a height of 5,000 feet from the sea—400 square miles of marble. By leaps and bounds the demand for Carrara marble has spread since first a Roman slave scratched the snowy bed with his iron pick.

COLOR PICTURE SENT BY RADIO "PAINTED" ON RECEIVER

Colored pictures broadcast by wireless can be reproduced by means of a machine that breaks up the original into three primary shades, red, blue, and yellow. A record of each of these "primaries" is made and sent to the receiving device, where they are recorded on films. By combining the films in final printing the various tints of the subject are copied exactly as they appeared at the sending end. In the transmitter a sensitized cylinder is imprinted through a screen that separates the ground colors into dots.

HAIR DRIER WITH SIX BLOWERS SAVES SWIMMERS' TIME

Six swimmers can dry their hair at once with a machine devised to save time for women bathers in a western natatorium. A half dozen individual tubes are provided, and each hose carries a large volume of air. Run by electricity, the apparatus combines heat with a blower. It is called upon to care for the needs of about 200 women a day and it is said to withstand the strain of constant operation better than other types.

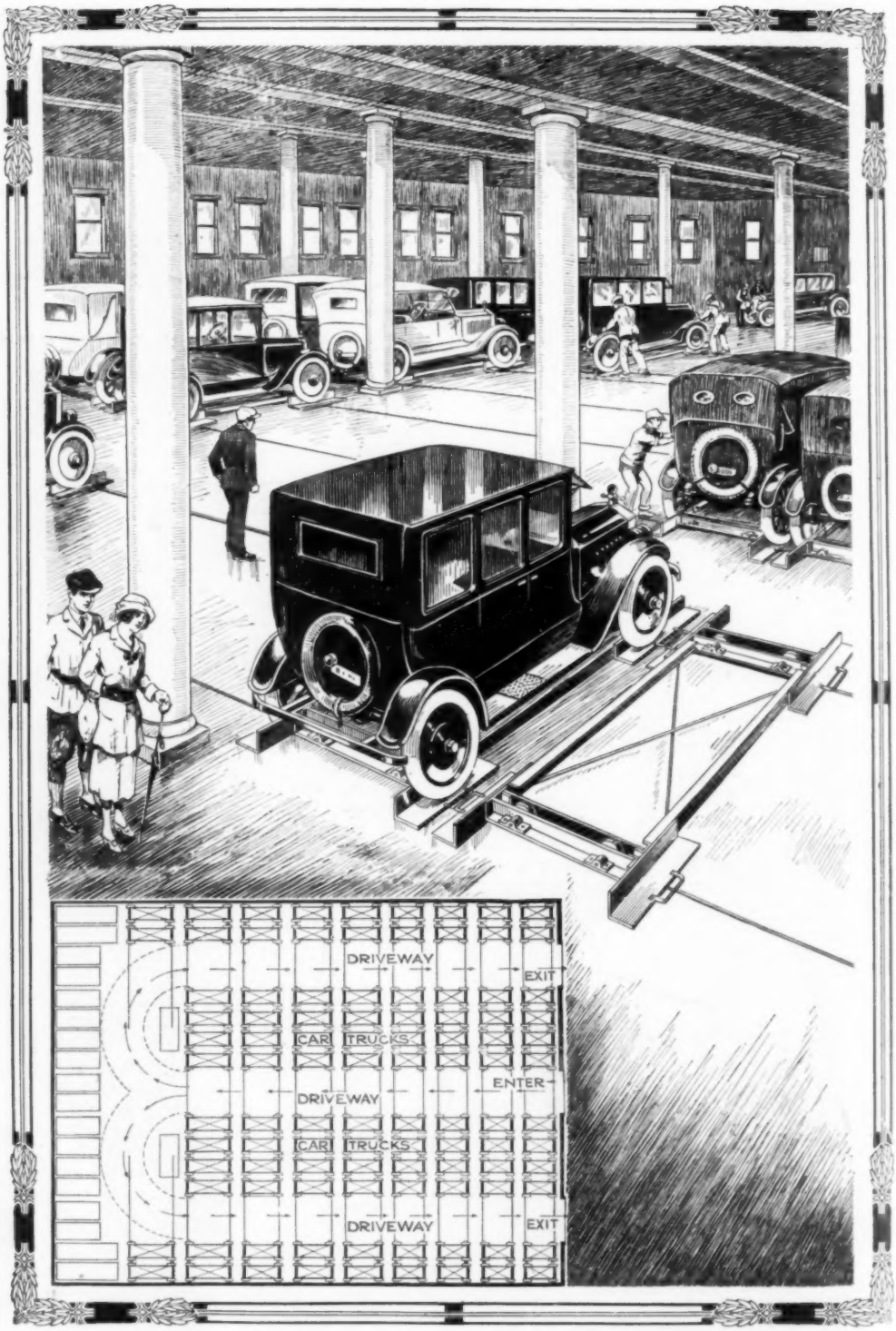
Natatorium Hair Drier that Can Supply Warm Air from Six Blowers at the Same Time

ELECTRIC HAMMER HAS ONE MOVING PART

Without a motor, gears, cranks, or rods, an electric hammer is being made for drilling and chipping. A hardened steel

Electric Hammer with Single Movable Part That Takes Less Current than Flatiron

head which goes back and forth in a bronze barrel is the only moving part. At the end is a winding of wire which becomes a temporary magnet, alternately as the current is received, first top and then bottom. This is done by taking advantage of the alteration of the current itself and requires no triggers or mechanical switches. It uses less electricity than a flatiron and is said to result in a 300-percent saving in labor costs. Because of its compactness, the device is of special benefit to contractors, sign manufacturers, steam fitters, plumbers, and elevator builders. The machine is said to bore a one-inch hole three inches deep in dense concrete in one minute.



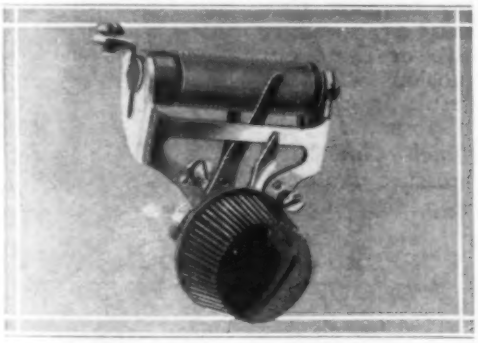
Storing Automobiles on Sliding Platforms in Garages, Where Space Is Saved and Danger of Damage from Scraping or Bumping Is Eliminated: Below, Floor Plan, Illustrating Operation of System

AUTO STORED ON SLIDING SHELF TO SAVE SPACE IN GARAGE

Rolled from a driveway onto platforms that slide to their storage spaces on steel rails imbedded in the floor, automobiles can be parked in garages with great saving of room and little danger of damage from contact with posts, walls, or other cars, by the invention of a mid-western engineer. The system, it is said, permits a third more machines to be accommodated than by other methods. Any of the moving "shelves" can be pushed to the passageways for loading and returned to position in a few moments. Owing to the ease with which they can be moved, hand power alone is required. Attendants are also relieved of the trouble of manipulating cars to guide them into stalls of crowded garages.

RHEOSTAT TO FIT ALL TUBES FOR RADIO OUTFITS

To save radio fans the expense of buying a new rheostat when changing from one tube to another and to spare them the labor of removing the device from the panel, a middle-western man is making an instrument that will control any resistance, merely by inserting the correct



Radio Rheostat with Detachable Cartridge That Saves Replacing by Ability to Fit All Tubes

cartridge. This is clipped in without the slightest change to the bracket. Less than an inch in depth, it takes little space on the board. It can be used on the dry cell and is inexpensive. When a change is made from the low-resistance tube to a storage battery it does not require replacing.

¶Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine.

BEAUTY OF ROSES AT NIGHT IS SHOWN BY LIGHTS

Tiny electric lights, concealed in the blossoms of artificial roses and other flowers, add a warm glow to the lifelike appear-

Artificial Flowers in the Blossoms of Which Tiny Electric Lights Are Concealed

ance of the bouquet. House current is used to illuminate the display, which is made entirely by hand from the fireproof muslin leaves to the varnished basket of skillfully created bark. Satin, silk, and plush also are used in making the foliage.

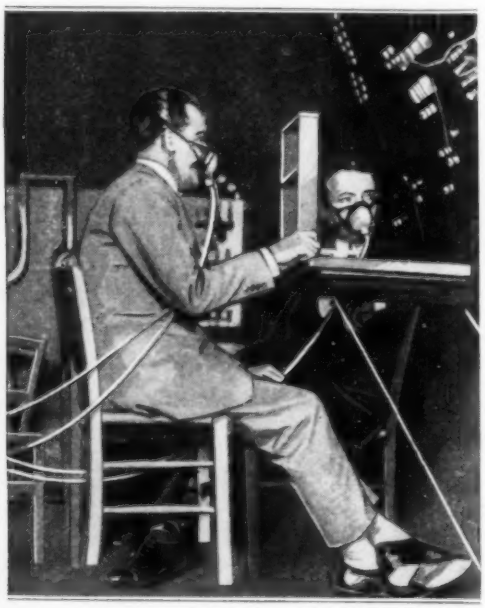
SPIKES IN TOP OF PITCHER SERVE AS CAN OPENER

By placing spikes in the lid of a pitcher now being made, in which a can of condensed milk fits, the need of an opener is done away with, as the tin is punctured when the cover is pressed down. After being put in the receptacle there is no need of touching the can again until its contents have been used. Covered on all sides by this holder, it is thus

protected from insects and dirt. A single downward movement of the hand perforates the holes through which the milk flows freely, and there is no time wasted in hunting for some sharp instrument to perform this task. The device is nickel-plated metal.

AIR TEST FOR PILOT ON GROUND TO PREVENT DEATH IN SKY

To protect pilots of airplanes from disastrous accidents when striving for altitude records, rarefied air is fed to them



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Testing the Endurance of Airplane Pilots Before They Undertake Hazards of Altitude Flights

from a special apparatus prior to flights to determine whether they can endure the atmosphere thousands of feet above the surface of the earth. In the comfort and security of a warm room, instead of at the controls of a plane, pilots determine if their lungs and hearts can stand the strain of climbing miles into the sky. Physicians directing the tests accurately gauge the heights to which the subjects can mount without endangering their lives. At extremely high levels, life-sustaining oxygen is supplied from tanks. Heavy clothing also is needed to resist the low temperature. Some pilots, in past attempts to scale to dizzy heights, have returned to earth with their faces, hands, or feet frostbitten and so exhausted physically that doctors had to attend them.

OCCUPANT OF KING TUT'S TOMB ONLY "SHADOWY" PRETENDER

Science, to learn more of the life of ancient Egypt, will reopen King Tutankhamen's tomb and fully explore the innermost chambers, it was announced recently by one of the discoverers, who says that the occupant of the imperial grave was not of royal blood and was but a "shadowy king" who claimed the throne through marriage. Less than one-fourth of the buried relics have been removed. To complete that task will require at least two years, he says. It is thought that when the sarcophagus is opened the body of the king will be found, jewel crowned and dressed in magnificent robes. An American member of the searching party states that the articles found in the tomb were products of arts in many respects superior to those of the present, and that only in the realms of electrical and mechanical discoveries and in the field of medicine has man advanced since the days of the Pharaohs.

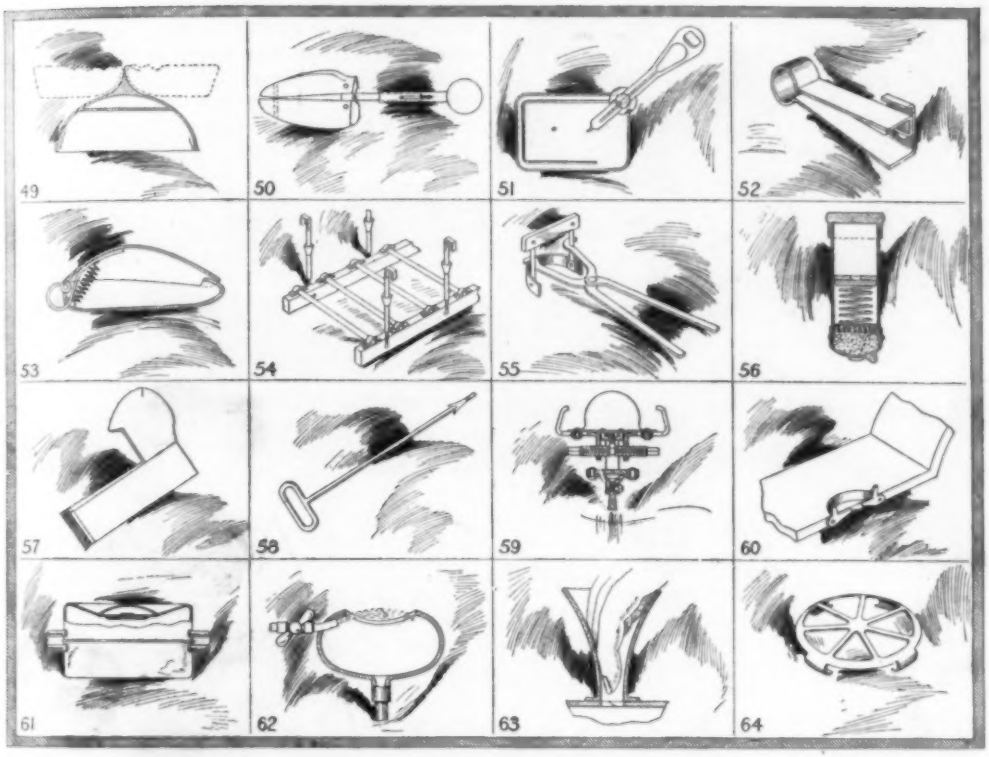
WHISTLING AUTO-LOCK ALARM PREVENTS THEFT OF CAR

To attract attention and at the same time prevent the theft of an automobile, a whistling lock has been patented that fits between the exhaust manifold and the muffler. Locking it shuts the pipe and turns on the whistling device. If a thief should try to start the motor, the first two or three explosions would result in a shrill alarm, after which the back pressure would stop the engine.

COPPER PIPE FOUND IN EGYPT RELIC OF ANCIENT PLUMBER

That plumbers who plied their trade in Egypt more than 5,000 years ago employed copper in their work, is proved, according to authorities, by a pipe made of the red metal found at Giza near the tomb of an ancient king. A bronze bathtub was also discovered in Italy, where it had been buried by the eruption of Mt. Vesuvius in 76 A. D., and it will still hold water. The enduring qualities of alloys containing copper are also shown in a bronze figure of "The Flight of Time," known to date from the sixth century, and the famous snake column of Constantinople that has been exposed to the wear of elements since 479 A. D.

These Articles Are for Everyday Use But— Can *You* Name Them?



JUST to help you, the use for which the articles are intended is as follows: No. 49, for personal cleanliness. No. 50, as part of wardrobe. No. 51, in the home. No. 52, by men. No. 53, for personal convenience. No. 54, on the farm. No. 55, on the farm. No. 56, in the office. No. 57, for cold weather. No. 58, in the home. No. 59, for sport. No. 60, about the home. No. 61, in the home. No. 62, for public use. No. 63, in a store. No. 64, for personal convenience.

Popular Mechanics Magazine offers no prizes for correct answers to these problems, but presents them for the interest it believes its readers will find in attempting to determine the nature of the various articles shown.

If you think you have the right answers you can find out by comparing them with the correct list which will appear in Popular Mechanics Magazine for January.

In November the following articles were shown. No. 33, fruit picker. No. 34, nail buffer. No. 35, nail set and holder. No. 36, tool to grain wood artificially. No. 37, safety razor. No. 38, teeth spreader. No. 39, wire clothespin. No. 40, eyeglass chain holder. No. 41, safety-valve for radiator. No. 42, hatpin guard. No. 43, knee-guard. No. 44, date stamp. No. 45, padlock. No. 46, churn. No. 47, holder for putting up electric-light bulbs and shades. No. 48, non-refillable bottle.

CARPET SAVES BALL PARK FROM FLYING HOOFS

To protect the diamond of an eastern ball park from the flying hoofs of the mounts of western riders who recently took part in a rodeo, the entire field was covered with a mat containing 100,000 feet of coco fiber. Scores of workmen were kept busy for days laying the heavy carpet, huge electric sewing machines stitching the pieces together as they were stretched on the ground. As it costs thousands of dollars to get a major-league diamond in playing condition, this precaution against injury to the sod was demanded before the management would allow the stadium to be used for the meet.

Stitching and Laying Great Coco-Fiber Carpet over Ball Park to Save Sod from the Hoofs of Horses During the Staging of a Western Rodeo

CHEESE WAS POPULAR TIDBIT AMONG EARLY PEOPLES

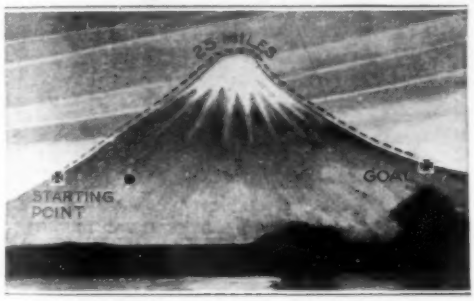
According to experts there are about 245 kinds of cheese made by as many different methods. One of the oldest forms of preserving milk as food, mention of it has been found among records dating back for centuries. The "bellelay" cheese, often referred to as "monk's head," is believed to have been first made by the monks of the canton of Berne, Switzerland, in the early part of the fifteenth century. "Brie," a cheese familiar to many in this country, has been made in France for hundreds of years. A curious fact surrounds the origin of "caciovallo," which means "horse cheese." For years no one could tell why it was so called, but two explanations were recently offered. One is that it was first known in the region of Monte Cavallo; the other is that the imprint of a horse's head was stamped on each package as a trade-mark. "Isigny," supposed to be among the first American cheeses, was made about thirty years ago, while attempting to imitate the popular camembert. Another domestic brand, "jack," was known over a quarter of a century ago in California under the name of Monterey cheese. The green mold which appears in the aristocratic roquefort is produced by covering the whey with moldy bread crumbs when packing it for ripening in the caves where it gets its "age." In different parts of the world cheese is made from the milk of cows, goats, sheep, and horses.

SECRET RAY TO STOP PLANES IS SEEN IN ACCIDENTS

That some secret means has been discovered for damaging airplanes in flight is the belief expressed by English scientists as the result of nearly 30 forced landings in central Europe recently. One theory is that wireless waves put the electrical parts of the machines out of action. Another is that rays are directed to vital points of the planes by reflectors, as it has been noticed that the accidents generally take place on clear days. In one instance, it is said, a pilot discovered a mysterious hole in the oil tank, and the solder on the piping had melted.

MARATHON RUN OVER CRATER OF OLD VOLCANO IN JAPAN

Testing the endurance of the stoutest contenders, a 25-mile marathon race held in Japan recently was run over the top of the volcanic mountain, Fujiyama. Beginning on one slope the course passed upward and across the old crater, from



Course of Marathon Run, the Winner Covering the Distance in Four and a Half Hours

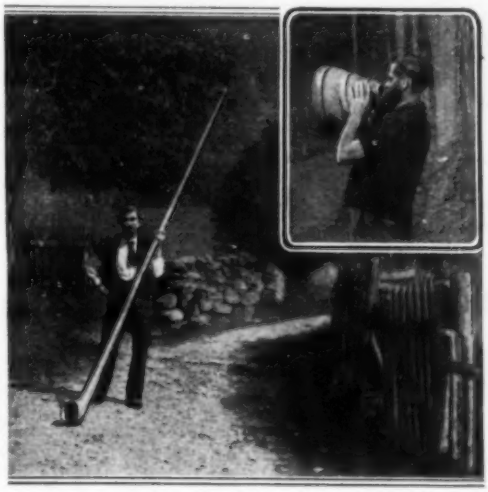
which steam still rises at times, and down the other side. As many difficulties were encountered in the descent to the goal as were experienced in climbing the first part of the way. Of 50 entrants, 25 failed to reach the "finish" marker at all. The winner covered the distance in slightly less than four and a half hours.

FISH ARE USED FOR CANDLES

For lighting their dwellings in the long evenings of arctic winter, Siwash Indians are reported to use dried fish, called eulachons, shaped like smelts, which are so full of oil that, when dried, they burn nearly as well as sperm tapers. The natives also eat these fish and extract cooking oil from them.

HORN TWICE SIZE OF PLAYER CARVED FROM TREE LIMB

In the Alps Mountains a horn 15 feet long, used to sound calls and signal blasts, has been carved from a single piece of



Crude Trumpet and Horn Carved from Tree Limb, Used by the Alpine Mountaineers

wood. It is said that it can be heard for miles through the valleys and gorges, and its echoes last for many minutes after it has been blown upon. Another instrument used by the Alpine mountaineer is a crude trumpet shaped somewhat like a flowerpot, which he sounds in the evening from a point of high ground. Its music is claimed to be a prayer that keeps illness and misfortune from the household of the herder.

DROP IN RADIUM PRICE SEEN AS RESULT OF DISCOVERY

What is described as probably the largest deposit of radium in the world is reported to have been found recently by an expedition to Russian Turkestan. As a result, in the opinion of scientists, the price of this precious metal may no longer be prohibitive and it may soon be a part of every hospital's equipment. The price dropped from $110,000 to $75,000 a gram last fall when it became known that extensive quantities of radium-bearing ores had been found in Belgian Kongo. Prior to that time most of it was extracted from corrotite ores in Colorado. Last July, it was estimated the world's supply was eight ounces, almost half of which had been manufactured in America from ore found in the West.

HAY-FEVER CURE FROM WEED STARTS A NEW INDUSTRY

Following the discovery some time ago that a serum made from the pollen of certain plants was of benefit in relieving

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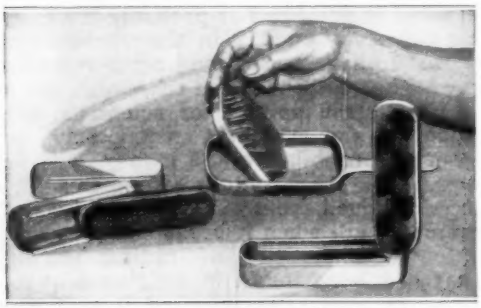
Collecting the Pollen of Ragweed Plants to Make Extract for Treatment of Hay-Fever Victims

hay-fever victims, a new industry has grown up. Many persons now are employed in the cultivation of ragweed plants. These are covered by paper bags and when the pollen is shed, it is collected carefully and the extract made that is said to bring relief to the sufferers.

BRUSHES FOLDING INTO BACKS KEEP BRISTLES CLEAN

Brushes are being made with the bristles on loose bodies that can be reversed and folded into the backs to protect them against dust and damage. The handle and the case which forms the covering are in one piece. By raising one end of the brush, which is fastened to the frame by two pins sliding in grooves, it can be easily turned and replaced after using without detaching it



Toilet Brushes That Can Be Folded into Backs to Keep the Bristles Clean

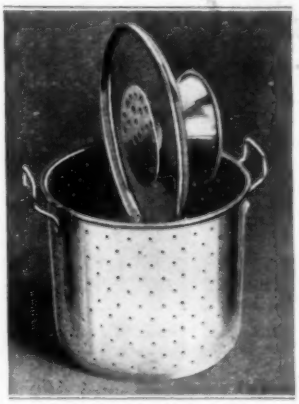
from the case. The brushes are manufactured in several sizes for dressing-room and toilet purposes.

RELIGION AND CLIMATE CAUSE MARKET FOR RUBBERS

Religion as well as climate is responsible for the demand in Turkey and Persia for rubber overshoes, says a recent commercial report. Practices of the religious faiths require that the outer footgear be removed on entering a house of worship, and the rubber shoe replaces the heavy sandal or boot while the wearer is at prayer. Persians desire a lightweight rubber as their women folk wear them in place of slippers, preferring those lined with brightly colored felt. Palestine and Syria also come in for a share of the article. It is estimated that several hundred thousands of pairs were annually shipped to these countries prior to the Great War.

NONSPLASH COLANDER CLEANS FRUIT WITHOUT SHAKING

Turning a stream of water to spray as it runs from a faucet through a cover, a colander being made thus prevents splashing when cleaning fruits or vegetables. Guided by a funnel, the liquid strikes a perforated disk, which distributes it evenly over the contents, eliminating the necessity of handling, shaking, or tossing the foodstuffs to rinse them. In addition, the kitchen device is adaptable to other uses, such as sterilizing small bottles, or for frying doughnuts and potatoes. Patents are pending on this utensil.



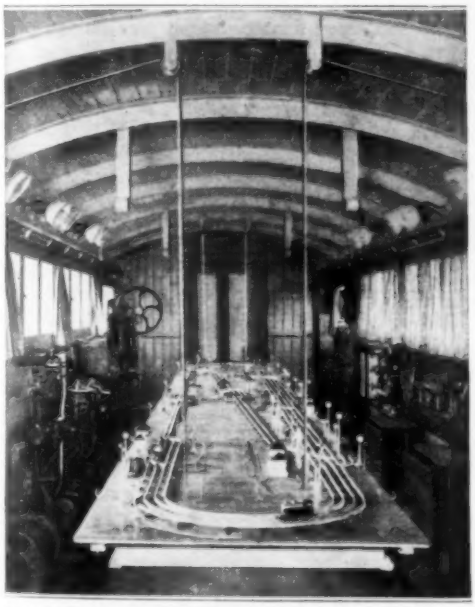
ICELANDERS TO OBTAIN POWER AND HEAT FROM GEYSERS

From a belt of geysers and hot springs within a mile of Reykjavik, the capital of Iceland, plans are being made to obtain water to heat the entire nation. According to preliminary outlines already prepared, the waters will be brought into the city in wooden pipes, connecting with all the buildings, thus eliminating, to a great

extent, the use of coal for fuel. For many years, these gushers have been used by housewives as laundries and as a source of hot water. Bath and washhouses surrounding the area are entirely heated from the steam supplied by nature.

RAILWAY TRACK MODEL SHOWS HOW TO AVOID WRECKS

Railway track models mounted on long tables are being used in France to instruct signalmen and other employes how to solve many of the problems involving the safety of passengers. When not in use, the miniatures can be raised to the top of the cars in which they are transported about the country. All of the signals are in their regular positions on the stands and are operated by cord and lever control. On a single-track line, an electric arrangement makes it possible to announce with light and bell the approach of a train and to reproduce the



Model System of Railway Tracks and Signals Used in France to Instruct Trainmen

signals. Special training is given in protecting trains in case a warning fails to operate or of some service accident.

¶ Within the last 20 years, from 1902 to 1922, the number of pupils enrolled in the public schools increased from 16,123,050 to 22,100,070, according to recent figures.

SCALE FOLDS AGAINST WALL WHEN NOT IN USE

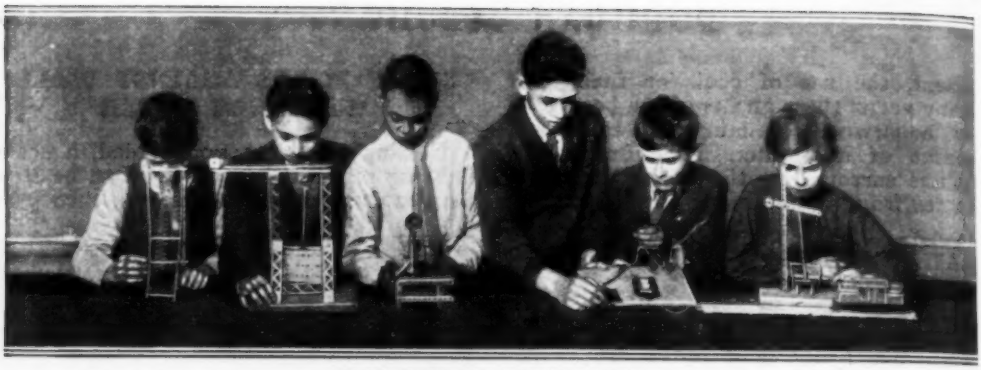
Folding up when not needed, a scale is being made in Europe that can be suspended from a hook in a wall, thus tak-

Folding Household Scales for Either Small or Large Packages Prevent Short Weights

ing up very little space. For use, its front beam is pulled down, its weights pushed back at each end, and the scale balanced by means of a screw. The heaviness of an object can then be determined by moving the numbered disks forward until the pan balances. It will accurately weigh articles up to 15 pounds. Bulky packages, such as fruit baskets and market bags, can be hung from a hook on the underside of the scale pan.

STONE AGE ISLAND NATIVES PAINT SELVES YELLOW

Cut off from the outside world by walls of coral 300 feet high that form the shores of their island, natives of Rennell, one of the Solomon group, have advanced no higher in civilization than the Stone Age, according to a missionary who recently visited them. Possessing little iron, these islanders still use barbed wooden lances, and throw spears tipped with splints of human bone that break off in the wound. Good fighters and powerful wrestlers, they are peaceful despite their warlike appearance produced by yellow paint and tattooing. The only form of money is the teeth of flying foxes. In the interior of the island, once a gigantic atoll, there is a large lake connected to the sea only by fissures in the coral. The water is so salty that visitors cannot drink it, but the natives have become thoroughly accustomed to its taste.



Hands Helping to Train Keen Brains

Toy Models Help to Solve Many Problems for the Engineer and Inventor

Miniature Ships, Airplanes, Motors, Houses, and Building Blocks Are Found of Assistance in Visualizing Their Ideas

FIRST intended only to amuse children, toys, or miniatures, are now being used everywhere by engineers, architects, builders, and inventors to visualize their problems and to quickly test out their ideas.

So rapidly has the demand for these models increased that their construction has become a science in itself, resulting in the creation of a new industry that employs thousands of men throughout the country.

Realizing that the eye is many times quicker than the ear, schools also have turned to the use of what would have been considered mere playthings just a few years ago, in instructing both boys and girls.

In almost every branch of industry, models have proved of the greatest help. Just recently a noted automobile engineer, the head of a department employing a score of men, was found at his desk surrounded by bits of twisted paper, whittled sticks, shears, and glue pots.

"Building something for the children?" he was asked.

"Trying to solve this 'frame' problem," he answered, and went on to explain that the body of a motor car was the first part of the machine generally to wear out. "Squeaky doors and loosened panels are only a symptom—the result of a thing known as 'weave,'" he added.

Then he exhibited two pieces of heavy paper held parallel by four strips bent in the form of "L's"—like the bare frame of a car. Taking one side in each hand, he bent them back and forth. "That is what happens when a car goes over a bump," he remarked, "and naturally the body can't stand the strain and loosens up."

Next he picked up a similar paper frame in which the sides were held together by round tubes of paper in the form of a letter "O." "Try to bend that," he said. This proved impossible without actually breaking it, and the engineer leaned back with a smile.

"It has taken us a good many years to think that out," he went on. "I could talk to you for a month on the many factors entering into the problem without making it clear, but by simply bending those bits of paper, you grasp it in an instant. It's a case of what the eye sees the mind believes.

"Eliminating all scientific formula, you realize that, while the amount of material in these two frames is equal, the change in design of the cross members from an 'L' form to the 'O' will eliminate a bending, or 'weave,' that cannot but be very destructive to the body of the car."

In Washington on almost any afternoon, a group of naval officers and engineers may be found gathered about a tank of water in one of the government buildings. Just above the surface, an electrically operated beam is towing several model boat hulls. In appearance, these little ships are similar to those with which children play in the parks. But this is serious business.

As the miniatures are pulled through the water, a scale registers the amount of pull, and from its readings, which indicate the amount of resistance that varies

With the Help of Their Hands, Students Being Trained Through Sense of Touch and Keenness of Vision to Solve Mechanical Problems

Turning Boys and Girls into Inventors by Stimulating Their Natural Curiosity

Working Models Give Insight into the Wonders of Science More Quickly than Textbooks

Creative Instinct of Students Is Stirred by Building Small Locomotives and Steam Engines That Run

with the lines, the proper shapes of Uncle Sam's warships are determined. Similar tests also are used by shipbuilding firms, and the model of today is often the great liner of tomorrow, every curve having been worked out during the experiments.

In another building, there is a great, horn-shaped instrument through which the air blows with cyclonic force. This is called a wind machine, and it is used in testing small airplanes. Without its aid in the study of wing positions, body shapes, and propeller designs, much of the progress recently made by aviation would have been impossible.

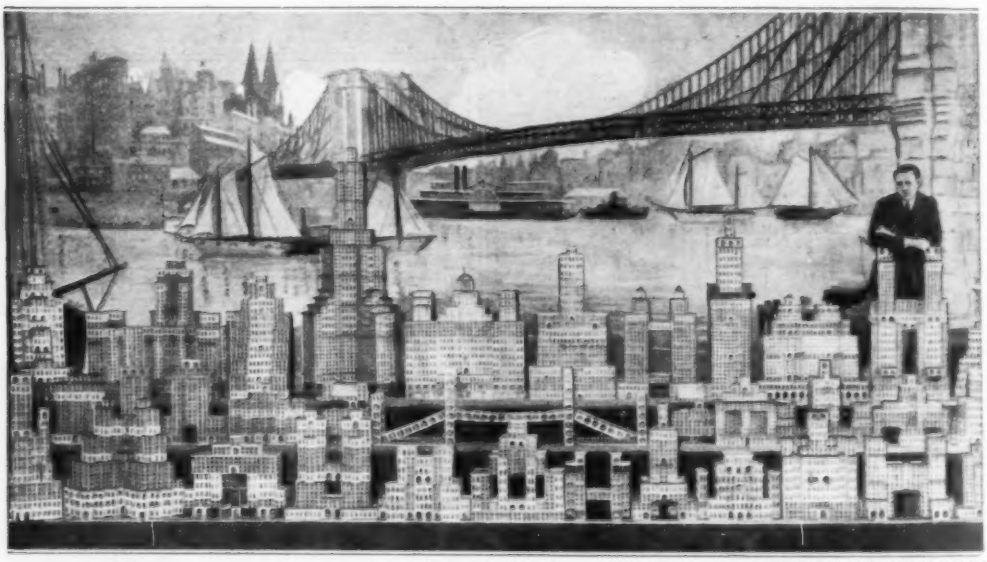
Another use to which the models have been put is in the selling of houses and machinery. Miniature bungalows, for instance, enable the home buyer to select the type best suited to his needs. Devices too heavy to carry, such as road-building machines, may be reduced to the size of toys for the convenience of traveling salesmen. Blocks used by children have proved of the greatest help to architects in enabling them to visualize their designs and to study the effect of a finished structure.

One of America's greatest railway systems schools its employes in train dispatching and signal engineering through the use of toy electric trains. Working with the hands has been found to refresh the brain and to teach it to function systematically. That is why manual training and summer schools with physical programs have proved so successful. In one such classroom desks and tables are piled high with objects and exhibits. The "lesson" the teacher is "reviewing" is a windmill—and a homemade one, too. The textbooks are toys and mechanical contrivances the children have made themselves.

The science room in this school looks more like a laboratory than a schoolroom. It is equipped with long, black-topped tables. The walls are made into blackboards and the entire room is circled with a large gas pipe, from which burners project at every foot or two. Overhead is a perfect network of wires, with a score or more electric drops equipped with two or three-way sockets.

One end of the room is packed with tables and huge desks—all covered with various mechanical and electrical apparatus. Prominent among them is a table given over to steam engines, superintended at this moment by a girl with a very businesslike air. Four boys are working under her directions. Their problem, it seems, is to furnish power from three small steam engines to operate a perfect maze of mechanical contrivances on the next table.

"That class," said the teacher indicating the two tables and the dozen children watching the workers at them, is lost in the intricacies of traction. They have been experimenting with a caterpillar tank, and now they are at the steam engines.



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Toys Built for Children Are Found Useful by Architects to Assist Them in Their Work and to Visualize Their Problems in the Construction of Skyscrapers

IRON FINGERS CRACK WALNUTS TOO SMALL FOR MARKET

Machines that can crack five tons of nuts in a day and keep 50 girls busy separating the meats from the shells are in operation in the West. Grading of English walnuts is no longer done by hand, but is performed by a vacuum device that picks the culls from the high-grade ones as they are carried along on an endless sieve belt. In another apparatus, the small nuts are cracked by a series of iron fingers on a cylinder so arranged that the shells are broken without injury to the meats. Still another contrivance salvages bits of nut-meats that are missed by the sorters. This little gleaner, it is claimed, saves $50 a day.

WINDOW LOCK LETS IN AIR BUT BARS OUT THIEF

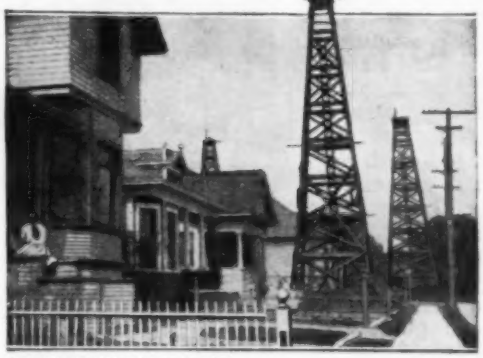
Gripping a window casing with its corrugated jaws, a combination lock and sash holder, that operates automatically is being made to hold an open or shut window securely in place. Fastened to the outer edge of the frame, the device keeps the sash from rattling or falling and breaking the glass. A slight pressure upon two levers releases its grip, and it is sturdy enough to sustain a large window and to foil a burglar.

HAND CRANK ON CORN POPPER DOES AWAY WITH SHAKING

Popping corn by turning a crank instead of shaking the kernels over a fire is made possible by a recent utensil for household use. The handle attached to the cover of a pan has two wings at the bottom which keep the contents in constant motion and so prevent burning. It is claimed that the device requires little heat and will pop corn on gas, kerosene, or wood stoves.

OIL BOOM IN WEST RECALLS MEMORY OF GOLD RUSH

Memories of the "days of '49" are recalled by the oil boom in southern California. With the opening of new fields, and the bringing in of "gushers," work goes feverishly on night and day. Fortunes are won and lost between sunrise and dark. In several towns, the drillers have even invaded the residential sections and the sight of ugly derricks in front yards is not uncommon.



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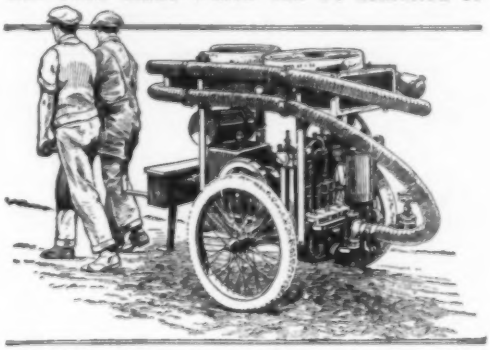
Oil-Well Derricks in Front Yards Are One Result of Big Rush in Town of Southern California

TWO-MAN FIRE FIGHTER RUN BY SMALL GAS MOTOR

For fighting fires in rural districts, a small, motor-driven pumping apparatus has been made which can be attached to an automobile, motorcycle, or drawn by two men. It consists of a gas engine, pump, and hose mounted on two wheels. In operation, such an outfit will supply sufficient water for a one-half-inch fire nozzle under high pressure. Water may be drawn from any lake, creek, or well.

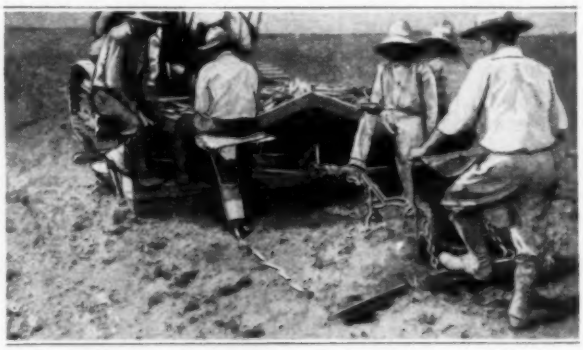


Fire Engine for Use in Small Towns, the Pump Being Operated by a Gasoline Motor

SUGAR-CANE PLANTER CUTS LABOR COSTS

Necessity is ever the mother of invention. It was the lean years in the sugar industry following the boom in 1920 that caused some of those responsible for sugar production in Hawaii to develop a planting machine that is being used with signal success.

The machine is still capable of much improvement, but even now it can plant 750 bags of seed in nine hours, using only five men, where 30 men were formerly required. As it travels over the field, it opens two furrows, into which the seed is dropped; a breaker plow attached to the rear opens up a large furrow between the rows for irrigation, and, at the same time, the seed is covered and the ground leveled.

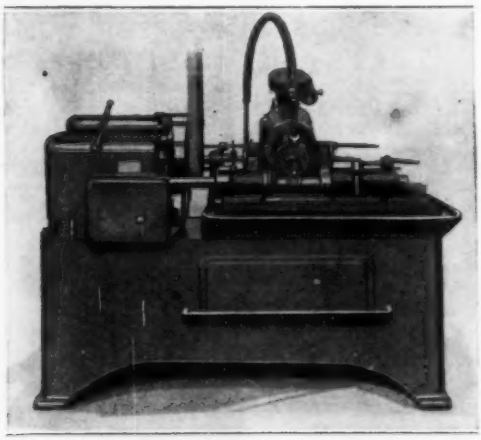


Rear View of Cane-Planting Machine, Showing Seed in Furrows, and Breaker Plow

The machine can also be used for planting potatoes.

GEAR-SHAPER CUTTER GENERATES THREADS

The application of the gear-shaper cutter to the generating of gear teeth, both of the plain spur and helical types, is now well known. A recent development, which is known as a thread generator,



Generator for Producing Accurate Threads Such as Used on Taps and Worms

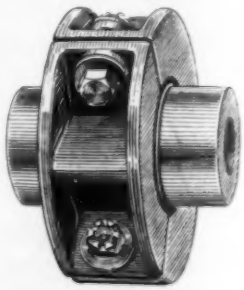
has still further increased the scope of this efficient tool, and it is now possible, by means of this cutter, to produce accurately generated thread shapes such as those used on taps and worms.

The thread generator has been so designed that modifications in work-holding fixtures as well as cutter heads enable it to handle a large variety of work. The standard machine has a capacity of 12 inches maximum length of thread; 18 inches maximum center distance; 4 inches outside diameter; 5/8 inch linear pitch; 23° helix angle, and 14½° pressure angle.

When provided with standard equipment it will cut single, double, triple, and quadruple threads of from ¼-inch linear pitch to 5/8-inch linear pitch, inclusive. By the use of special gearing in the cutter head, single-lead threads from 1/20-inch to ¼-inch linear pitch may also be cut.

COMPACT FLEXIBLE COUPLING IS DURABLE AND QUIET

Steel-faced leather liners cushion all shocks in a recently produced flexible coupling, and render it noiseless. The transmission element is a three-part housing "cinched" onto the coupling teeth, inclosing them in a grease-tight and dustproof pocket. The steel-faced liners engage the teeth, and, owing to the centrifugal force present when the shafts are revolving, are kept well lubricated with the grease in the pocket. The flexibility of the coupling is obtained partly through the leather lining and partly by the ability of the housing to expand.

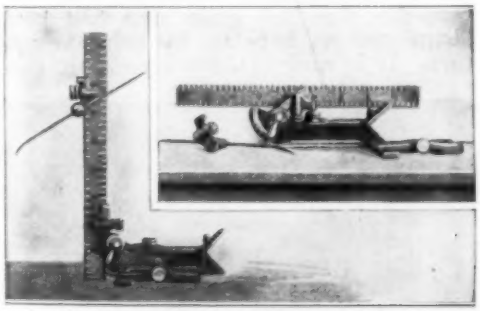


CENTER DRILL AND REAMER HAS INSERTED BLADE

Combining drill and center reamer in one, a centering tool for large shafts has recently made its appearance. The body or holder is made of mild steel, case-hardened, and the removable blade is of tungsten steel. Only four sizes of blades are necessary to center shafts from ⅝ to 10 in. in diameter, and it is expected that the blades can be produced for the same cost as the drill used in the first operation at present. On large work three operations are usually necessary—drilling, reaming, and countersinking; with the new tool, these operations are done at once. The blade is located in the holder by two 30° beveled edges at the bottom and securely clamped by a hardened binding screw, insuring the perfect centering of the blade in the toolholder body.

COMBINATION SQUARE HAS UNUSUAL FEATURES

Several interesting features are incorporated in a combination tool for machinists invented by an Omaha man. It is fitted with the grooved sliding scale common in combination squares, but the head is pivoted on a graduated quadrant, so that it can be used as a protractor as well as a square. When the blade is folded against the head on one side, the V-end of the head is bisected by the blade, thus forming a center square for round stock. With the aid of a readily detachable base and an adjustable scriber, the tool is converted into a surface gauge capable of fine adjustment. Many laying-out operations can be shortened by the aid of this tool.



Left, Combination Tool in Use as Surface Gauge; Insert, Tool with Blade Folded

MOTOR-DRIVEN SPADER REPLACES PLOW

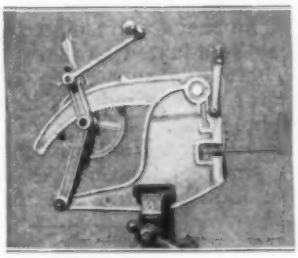
A machine which, it is claimed, will do the work of five plows at once, has been perfected by a middle-western inventor, and was recently demonstrated at the Milwaukee County, Wis., agricultural grounds.

A Motor-Driven Spading Machine That Will Do the Work of Five Plows

The implement consists of a number of forks attached to the rear of a tractor, and it spades, breaks, and pulverizes the land in the same fashion as the hand and foot-operated spade. The same tractor can pull a seeder attached to the motor spader, thus turning the soil and planting the crop at the same time.

VISE PUNCH HAS POWERFUL LEVERAGE

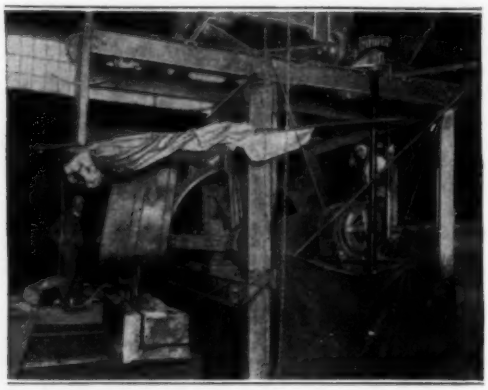
While simple in design, and light in weight, a recently patented portable punch is capable of piercing ¼-inch steel. The principle employed is that of the toggle lever, operated by simple gearing, and the design is such that the power applied is constantly increased as the punch is forced through the metal. The punch can be lowered or raised quickly without moving the gears, which are thus employed only when actually punching. The complete tool weighs only 65 pounds.



¶A measuring tape made of rustless steel has just been placed on the market.

STONE-CUTTING MACHINE EFFECTS ECONOMY

All work that can be done in lumber with a circular saw, channeling, tapering, recessing, and cutting at any angle, are some of the claims advanced for a new stone-cutting machine perfected by a western inventor. In addition, it is said



Cutting a Corner Block on a New Stone-Cutting Machine: Note the Accuracy of the Cuts

that 75 per cent of the hard work of preparing stone, and the usual loss of 30 per cent of stock are eliminated, and that the use of this machine permits the shop to be kept dustless, and sanitary.

A machine of this type has made remarkably low records for the cost of stone cutting, turning out the product at a cost of 10 cents per surface foot. In granite, the new machine, with one saw, cuts a total of 224 surface feet per day of 7 hours, with two men, thus equaling the work of five pneumatic surface-cutting machines.

The machine is electrically driven, but may be adapted to steam or water power. Where one saw blade is used, a 25-hp. motor is required, and for three blades a 75-hp. unit. With two or three saws, various combinations may be obtained by simple adjustments, one saw cutting, one molding, and the third grinding.

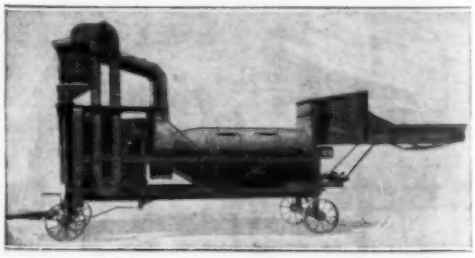
EXPERIMENTAL WORK AIDED BY LABORATORY STILL

Many operations that are quite simple in the laboratory are found impracticable to carry out on a commercial scale, and, in many cases, mass operation materially affects the results obtained in industrial chemical processes. It is desirable, therefore, when investigating a new process, or experimenting with a view to modify an old one, to use apparatus that will handle a larger quantity of material than the test tube or retort.

This is the purpose of a laboratory still recently placed on the market in England, which, with the aid of a few attachments, may be used for practically any distillation process now employed commercially. It is designed for working pressures up to 60 pounds per square inch, and is provided with a thermometer, pressure gauge, safety valve, and filler; it may also be fitted with a mechanical stirring device. The actual capacity of the still is 15 gallons, and it is thus not only adapted to research work, but may be used by manufacturers requiring but a small quantity of a particular product.

CENTRIFUGAL THRESHER LATEST FOR FARMER

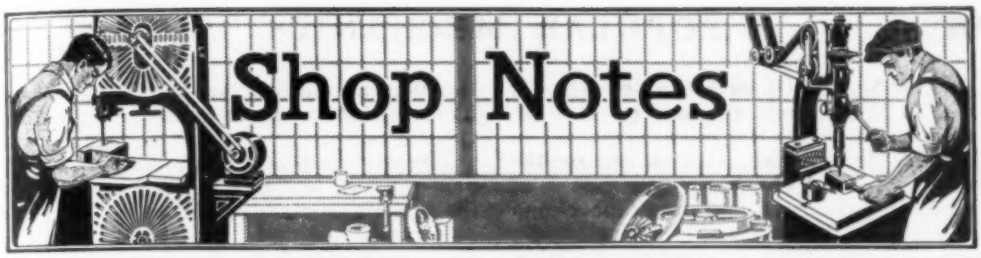
Centrifugal force is the principle utilized in the design of a new threshing machine, which, it is claimed, is lower in first cost and has less working parts than other threshers. In addition to these advantages, it is stated that the machine will thresh wet, damp, and sprouted grain, which cannot be handled with other machines, and that there is practically no cracking of grain or seeds. In a recent demonstration, the machine successfully threshed grain that had been abandoned as hopeless by other operators. It is now in daily operation, and,



A Thresher That Operates on a Principle New in Threshing Machines

while working at only half its capacity, is capable of threshing 1,000 bu. of good wheat per day. A governor on the machine prevents it from operating except when it is running at the proper speed to do good work.

Almost any farm tractor will operate the machine, and it can be pulled through the field alongside of a header, and be operated by power from the tractor, thus eliminating the weight and expense of an extra engine.



All Shop Notes published in 1922, in book form—Fifty Cents—from our Book Department.

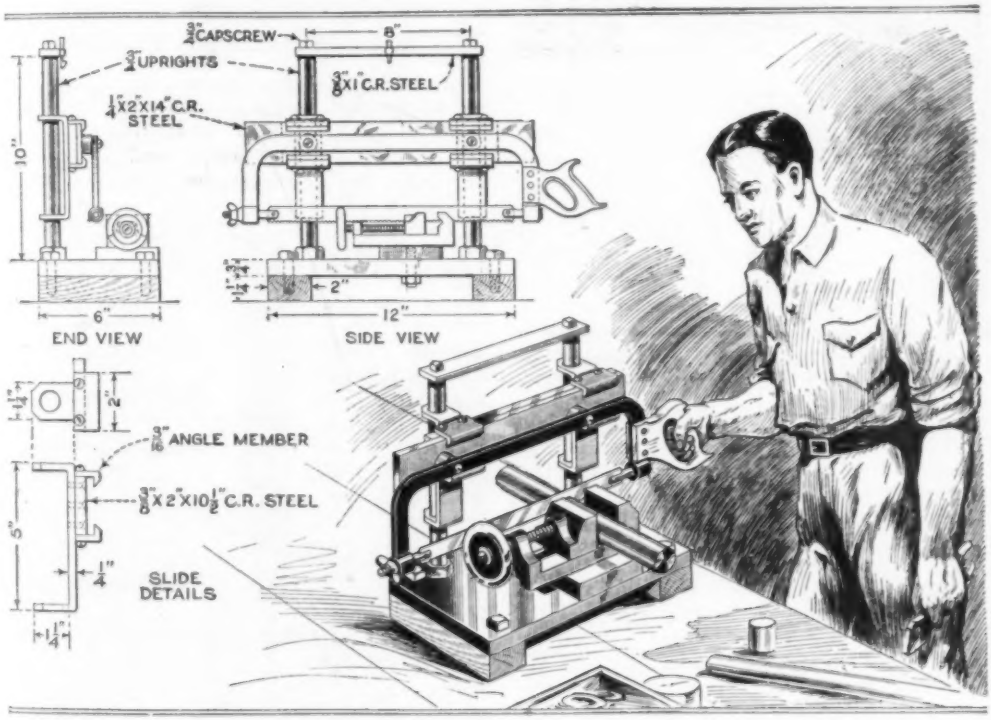
Making a Bench Hacksaw

BY J. V. ROMIG

THE bench hacksaw described in this article will prove a valuable addition to the small workshop; it is easily built from material obtainable everywhere, and the design is such that very little machine work is necessary.

The base is a piece of wrought-iron or steel plate, drilled and tapped for the ¾-in. standards, drilled for holding-down bolts, and slotted for the vise bolts. The standards are ¾-in. cold-rolled steel, threaded at one end, and drilled and tapped for capscrews at the other.

The saw, which should be of the heaviest hand pattern obtainable, is fastened to a piece of cold-rolled steel with round-head screws, as shown, and spaced away from it with ½-in. washers or collars. This machine-steel slide works in a bearing arrangement made from angle brackets of brass screwed to a machine-steel bar, and this, in turn, is screwed to vertical slide members, made of flat stock, bent, and drilled and reamed to fit the standards. They must be perfectly square with the standards, and should be a close, but free fit.



An Easily Made Bench Hacksaw That Will Prove Invaluable in the Small Workshop: No Castings Are Used and Little Machine Work Is Necessary

To the top of the standards is screwed a piece of flat stock, to stiffen them and hold them rigid. A latch is attached to

this bar, hooking over a pin on the back of the slide, to hold the saw in its highest position while the stock is placed in the vise for sawing. By mounting the base above the bench on two pieces of wood, the vise nut and nuts for clamp bolts are easily turned. The vise can be removed and work clamped to the base, when necessary.

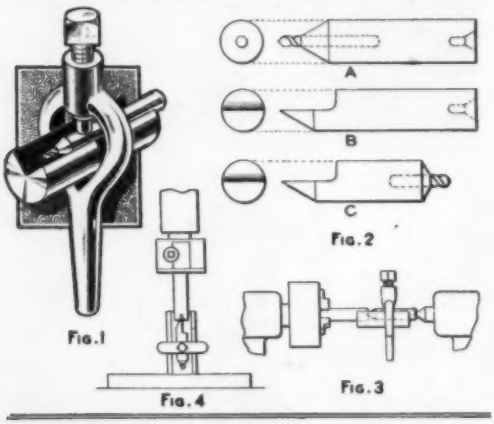
A wooden handle of the carpenter's-saw type should be used on the hacksaw, as it will not tire the hand as the round type does.

The vise is of the type used on small drill presses, and can be purchased from the makers of such machines.

Much better and quicker work can be done with a tool of this type than with a handsaw, and blade breakage is greatly reduced.

Centering Drill Rod Accurately

When machinists or toolmakers are required to make taps, reamers, counterbores, or similar tools out of drill rod, the centering must be done accurately.



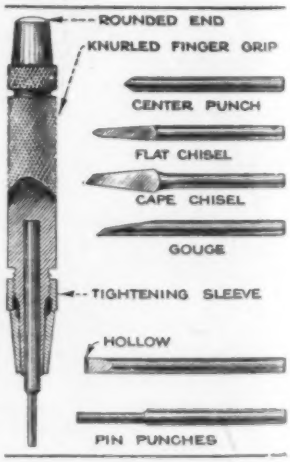
Simple Centering Tool for Use in Making Taps, Reamers, Counterbores, Etc., of Drill Rod

The simple toolholder illustrated has been found to give very good results. It consists of a round block, made from a length of steel rod, grooved as shown, finished smooth with a file or by grinding, casehardened, and used with the centering tools shown in Fig. 2.

The tools shown in details A and B of Fig. 2 are used when the centering is done on the lathe, tool A being used to drill the center hole and tool B to countersink it. Tool C is used on the drill press; it gives better results than the other tools in regard to speed, as there is no changing of centering tool, the block being turned upside down for countersinking. The length of this tool must be at least 3/8 or 1/2 in. shorter than the block, and its shank diameter the same as the diameter of the work. Tool A need not be shorter than the block, but its diameter must also be the same as the rod to be centered. The tool B should be made from .005 to .02 in. smaller than the work, to allow a certain amount of pressure against the sides of the groove in the block. Fig. 1 shows one of the tools in position in the block, held in place by means of a lathe dog. Care should be taken that there are no burrs on the rod ends when centering, otherwise the work will not be true. Figs. 3 and 4 show the tool in position for use on a lathe and drill press.

Convenient Punch and Chisel Set

A variable-sized punch and chisel set takes up very little space in the tool kit and is much lighter in weight than a whole set of solid tools. It can readily be made by any mechanic. The holder consists of two pieces, the handle and the tightening sleeve, which screws on the slitted end of the handle as shown, to clamp the shanks of the tools in the holder. The handle is knurled to facilitate holding it, particularly when using small chisels in confined places and corners.

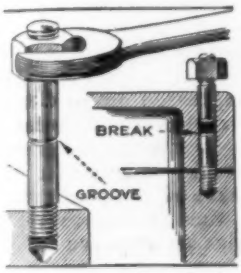


As many separate tools can be made as desired, to suit the needs of the user. The pin punches are made of various diameters at the nose, each just a little smaller than the pin it is to drive. All points or working faces should be hollow or concave, which will prevent the spreading of the pin, due to upsetting. Center punches, pin punches, chisels, and gouges are made out of tool steel or drill

rod forged to shape, and ground after hardening and drawing the temper. The tools used for driving purposes should be made of tool steel, carefully hardened, and drawn to a dark-brown or purple color, which makes them tough, and lessens the danger of breaking them.

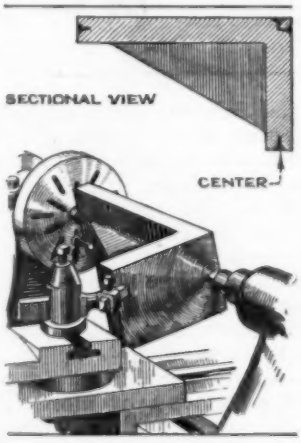
Safety Cut in Studs and Bolts

Studs and bolts used for attaching cylinder heads and plates on engines are frequently twisted off and the break often occurs inside of the hole, which makes it a difficult matter to remove the broken piece. This, however, can be prevented by making a V-cut, slightly deeper than the thread, around the stud or bolt above the surface, so that, if it breaks at all, it will break off at the groove, and can then be easily removed with a small pipe wrench.



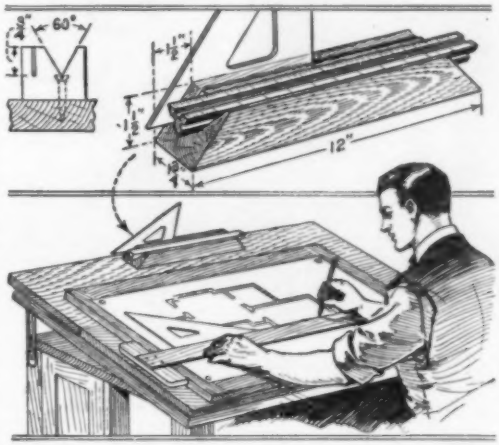
Machining Angle Plates on the Lathe

The machining of angle plates is usually done on the shaper or planer, but it can also be done on the lathe, when the former machines are not available. The angle plate is swung between the lathe centers as shown in the illustration, and it is then an easy matter to finish the faces. After the faces are finished, and have been tested for squareness, the sides are finished by mounting the angle plate with one edge against the faceplate, using washers or pieces of tin under each corner to true the plate perfectly square with the faceplate. The angle plate is then attached to the faceplate by clamps, resting on the brace.



Holder for Drafting Scale and Triangles

The holder for drafting scale and triangles, shown in the illustration, was designed to meet conditions in a drafting room of a technical school, where

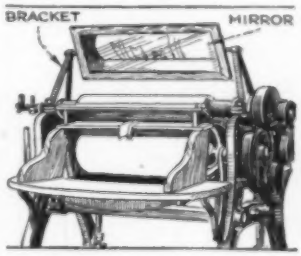


Holder for Drafting Scale and Triangles in a Schoolroom Prevents "Losing" or Exchanging Them

four classes used the same instruments alternately. The holder eliminates the necessity of returning the rules and triangles to the instructor at the end of each class period, as these articles can be easily seen on the desks and checked up. Any interchanging of triangles between desks is prevented by stamping the desk number on each. The upper detail shows the size and shape of the holder, and the drawing below shows how it is mounted on the desk.—E. G. Asku, Sarnia, Can.

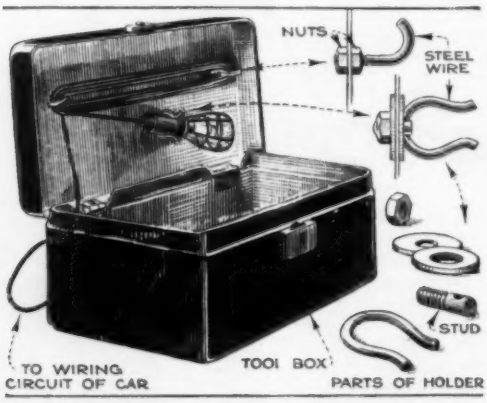
Mirror for Ironing Machine

On some types of ironing machines the work cannot be seen when it passes between the rollers, and the result is that it often comes out wrinkled. This trouble can be prevented by mounting a mirror on the frame of the machine as shown in the drawing, to enable the operator to look between the rollers. In case the work becomes doubled up or twisted, the machine is promptly shut off and reversed.



Storing Extension Lamp

An extension lamp with a 25-ft. cord is a very serviceable accessory for any motorist, but difficulty is usually encountered in handling the cord. Frequently it is placed in the tool box, but the objection to this, aside from the danger of tools cutting the cord, is that the tools must be removed when the cord is needed.

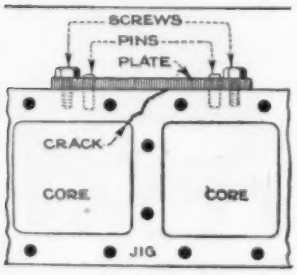


Auto Extension Lamp Conveniently Stored under the Tool-Box Lid to Avoid Damage from Tools

A much better place to store the cord is under the lid of the tool box, as shown in the drawing. The cord is wound on two hooks made from 1/4-in. rod, and the lamp is held by a spring holder, shown in the upper details. The cord is led through a hole drilled in the side of the box and is permanently connected with the wiring circuit of the car, so that the lamp is ready for use at all times.

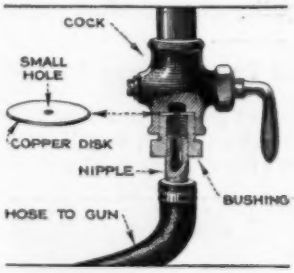
Repairing a Cracked Jig

In repairing a cracked drill jig for a large marine-motor crankcase, it was found impossible to use clamps to pull it together and therefore the repair was accomplished in the following way: The crack was first cleaned thoroughly, which was done by flooding it with gasoline and blowing it out with compressed air. After obtaining a piece of cold-rolled steel, 3/8-in. thick, just as wide as the jig was thick, and about 10 in. long, two screw holes were drilled near the ends and just inside of them two dowel-pin holes as shown. The surface of the jig was laid off and drilled to correspond, allowing 1/16 in. additional space between the holes to allow for the crack. Holes were then drilled and tapped in the jig to correspond to the screw holes in the plate. The plate was heated until it had expanded so that its holes were directly in line with the holes in the jig, and the pins and screws then driven in. As the plate cooled, its shrinkage closed the crack so tightly that it could hardly be seen.



Preventing Waste of Compressed Air

In shops using compressed air to clean machinery, dies and molds, or manufactured articles, there is always a great tendency to waste the air. The 1/16-in. or 1/8-in. hole in the nozzle of the air "gun" looks too small to the average workman; he therefore tries to improve it by reaming it out to a larger size, and this, of course, allows a greater volume of air to escape. In a large eastern plant this practice became very annoying and made it nearly impossible to keep up the air pressure, so that it was necessary to take preventive measures. All air pipes to machines and benches were of 3/8-in. pipe, terminating in a regulation 3/8-in. cock, bushed down to 1/8 in. A thin copper disk, with a 1/16-in. hole, drilled in the center, was placed between the bushing and the cock, at the bottom of the thread, as shown in the drawing. At 80 lb. pressure the plate allowed just enough air to pass to work the air gun properly. For the 1/8-in. size of gun, the disk is drilled with a 1/8-in. hole.



Another practice among a certain class of workmen is to blow their clothes with the compressed air, which is not only wasteful, but dangerous, as air at high pressure entering any openings of the body is liable to cause severe injuries. Furthermore, the dust on the clothes is not blown off but is blown through the clothes to the skin, defeating the very purpose of using the air.—A. S. Jamieson, Springfield, Mass.

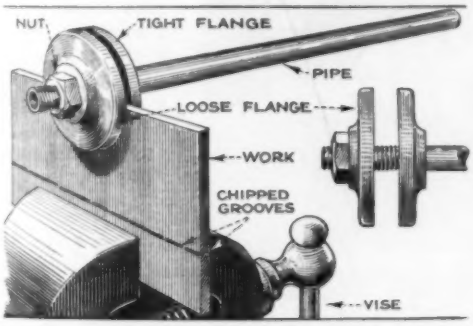
Removing Paint from Tile

Spots and splashes of paint on tiled floors present a very unsightly effect and should therefore be removed. This can readily be done by washing with a solution of caustic soda, which will remove the paint without the necessity of using an after wash of acid to destroy the effects of the alkali, plain water only being required. If the tile is likely to stain with the soda, a rinse of diluted ammonia will remove the spots, and the ammonia can then be washed off with clean water.

Breaking Off Iron Plate

A favorite method of separating a piece of iron plate from the main stock is to chip a groove along a line drawn to the required shape, and afterward to break the piece off by wrenching it or striking it with a hammer. This, however, often results in bending the piece, which makes it necessary to flatten it out again before it can be used.

In one shop where a great deal of this kind of work was done, the method shown in the illustration was found to be very convenient and to save considerable time,



A Handy and Time-Saving Tool for Breaking Off Pieces of Iron Plate without Bending Them

as with it, plates could be broken off without bending. The tool consists of a length of iron pipe threaded at one end, two pipe flanges, and a nut. One flange is screwed on the threaded end until it is tight, and the other is screwed on until the work is gripped fairly closely, the nut then being used to lock it. With the plate securely gripped in the vise, pressure is applied to the handle as the tool is rolled along the edge of the plate.

¶ In making drawings, do not dimension from the rough edge of a casting, but from a finished surface.

Holder for Filling Coal Bags

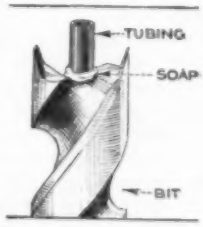
In the larger cities where the houses are so close together that a coal chute cannot be used to discharge the coal

A Handy Stand That Saves Considerable Time When Filling Coal Bags

from the wagon into the basement, it is common practice to use heavy canvas bags, which are filled at the coal yards. To facilitate the work of filling the bags the holder shown in the illustration was devised. It is made of heavy lumber and has hooks under the chute to hold the bag while it is being filled.—E. M. Scott, Chicago, Ill.

Using a Broken Bit

An auger or bit with a broken or badly damaged screw is usually discarded; it can be made serviceable, however, in a very simple manner. A short piece of tubing, equal in diameter to a smaller bit, is slipped over the broken or damaged screw point as shown, and filled with solder, any openings between the bottom of the tube and the bit being first filled with laundry soap. To use the tool, a hole is first drilled with the small bit the size of the tube, then the larger one can be used in the usual manner, without danger of running off, as the tube forms an excellent guide.

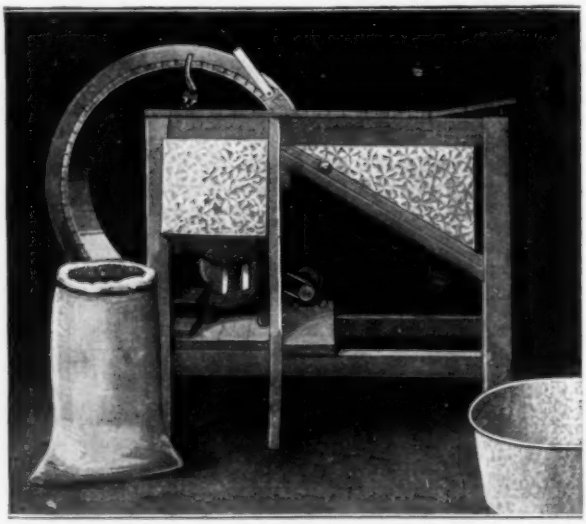


Making a Clover-Seed Huller and Scarifier

BY IRA D. MULLINAX

THE machine for hulling and scarifying sweet-clover seed described in this article was made by the boys in an Illinois High School. The machine was designed by the farm crops and agricultural engineering sections of Iowa State College, patented, and given to the people, so that anyone is at liberty to make and use it. It is in use by seed companies and farmers for scratching the seed coats of clovers and alfalfa so that the seeds may absorb moisture readily, thereby increasing greatly the prospects of obtaining a good "stand" from costly seed.

The machine may be built at home by any farmer possessing a kit of carpenter's tools, and who has average skill in their use. Most of the material needed for constructing the huller may be obtained from the local lumber and hardware dealers, as may be seen from the bill of material at the end of the article. The machine shown in the photograph measures approximately 5 ft. long, 2 ft. wide, and 4 ft. high, but the relative dimensions may be varied to a considerable extent without impairing the efficiency of the machine.



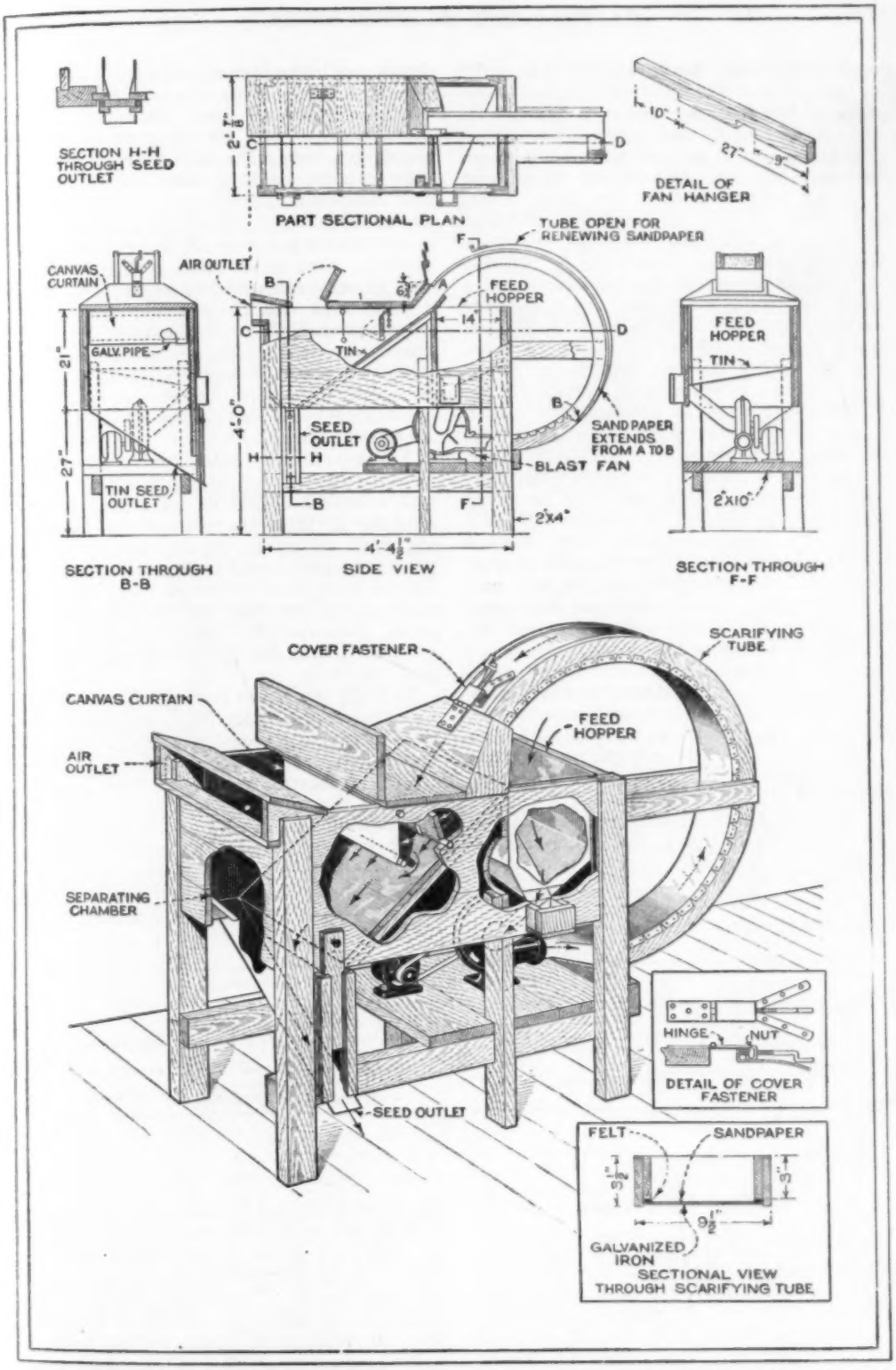
Hulling and Scarifying Machine Built by High-School Boys That Has Proved Profitable to Them and to Local Farmers

The sweet-clover seed is poured into the feed hopper and runs downward through a gate into a chute leading into the open side of a blast fan. The fan is driven by a ¼-hp. electric motor, although it can be belted to a countershaft mounted on the end of the huller, and driven by a gasoline engine or tractor, if necessary. The outlet of the fan is connected to the scarifying chamber or tube. The inner surface of the outer side of this tube is covered, from the point marked A, in the side view, to B, with emery cloth, sandpaper, or garnet paper.

The garnet paper, or whatever abrasive is used, should not extend below point B, as it is not desirable that the seeds be thrown directly against this surface. As the seeds are delivered into the fan casing by the feed chute they are struck sharply and forcibly by the fan blades. They are then carried by the strong airblast from the fan out through the throat and thrown against the hard, smooth surface of the lower end of the scarifying tube, and thence upward. When passing from B to A, the seeds are held in close contact with the rough surface of the garnet paper, and their hard coats are cracked, punctured, scratched, and otherwise softened, making it possible for them to absorb the ground moisture readily.

The seeds are delivered by the upper end of the scarifying tube into a compartment with a sloping tin-lined bottom, as indicated in the side and perspective views. In this compartment the force of the air is considerably reduced, and it makes its exit, carrying with it a portion of the chaff and waste. The seeds are stopped by an adjustable baffle board, which causes them to fall to the floor and run into the chute that delivers them to a bag or measure. Behind the first baffle, a second is fitted; this may be a canvas curtain, as shown, or a board similar to the first.

When building the machine, good white pine, or its equivalent, free from knots and checks, should be used; this is easily worked, and makes a light machine, which can easily be handled. The legs, braces, and other parts of the frame are made of 2 by 4-in. stock, surfaced on four sides. The sides, ends, top, partitions, etc., should be of good boards, surfaced and matched so as to make tight-fitting joints. The seeds are small and often high-priced, hence cracks in boards and



An Easily Built Machine That Will Hull Sweet-Clover Seed at the Rate of 10 to 12 Bushels an Hour: It Is Not Difficult to Operate and Will Pay for Itself in a Short Time

open joints may prove costly. The sides or panels are set into continuous mortises in the legs, as shown in section H-H, and glued and nailed in place. Strengthening all corners with metal braces is advisable, and the braces should be screwed to the wood. The baffle board is pivoted on long screws driven through the side panels into the lower ends of the board, and the upper end is adjusted by means of a chain hooked over a screw hook driven into the underside of the top. The board may be pivoted on a piece of pump rod running from side to side, if desired, simple tin straps bent around the rod and tacked to the board being used as bearings, as shown in the perspective view. The canvas curtain is of 6 to 10-oz. material, with a hem at top and bottom. The upper hem slips over a length of ⅜-in. iron rod, or pump rod, and the curtain is weighted with a length of galvanized-iron pipe, slipped into the lower hem. The size of this pipe depends upon the speed of the fan, and a little experimenting may be necessary in order to determine the proper weight.

The outer side of the scarifying tube is made of galvanized iron, cut and hinged about point B, and fastened at the top by a clamp made from a strap hinge, screw, and nut, as shown in the detail. The upper end of the galvanized iron is strengthened by a flat-iron spreader, riveted in place; the screw bears against the upturned end of this and draws the cover tightly around the tube frame, against the strip-felt packing shown in the tube detail.

The motor should be of a speed that will drive the blower at from 2,800 to 3,000 r.p.m., with the proper pulleys. The speed must be reduced for seeds that are softer than sweet-clover seed, or a portion of the abrasive may be removed from the scarifying tube, thus regulating the treatment so that only a small percentage of the seeds will be injured. With correct speeds and length of abrasive surface, not more than 2 per cent of the seeds will be broken. One application of garnet paper will usually treat 50 bu. or more.

The boys run their sweet-clover seed once through the machine to hull it, and then run it through a second time, when it is scarified. From one-half to four-fifths of the seed is hulled the first time, depending upon the quality and condition of the seed.

Students in the school have organized an agricultural club, which last year hulled and scarified 12,000 lb. of clean, salable seed for 25 farmers, some of the seed being sent 50 miles to the school. This year even more seed is being treated, and letters have been received from seven or eight states inquiring for prices on treated seed. The club has been charging local growers 1 cent per pound, on the basis of clean seed.

In 1922, ten times as much sweet clover was grown in this territory as in 1921, and this year the acreage will be greatly increased, a result much desired by agricultural research workers. The scarifier built by the boys has been a large factor in attaining this gratifying state of affairs, as it has provided the farmers with a service that they were unable to obtain elsewhere. Farmers in other communities can benefit greatly by following their example.

MATERIAL LIST

- 2 pieces 2 by 4 in. by 18 ft. white pine.
- 1 piece 1 by 4 in. by 12 ft. white pine.
- 3 pieces 2 by 10 in. by 2 ft. oak or birch.
- 60 board ft. 6, 8, or 10-in. matched white pine.
- 2 sheets 28-gauge galvanized iron.
- 1 blast fan.
- 1 ¼-hp. motor.
- 1 pair 5-in. strap hinges.
- 1 piece 3/16 by 2 by 8-in. wrought iron.
- 1 large hasp.
- 2 pulleys (size depending upon motor speed).
- 1 half-gal. can mixed paint.
- Nails, screws, bolts, felt, etc.

Refilling Barometers

Barometers that have developed air bubbles can be cleaned in the following way: Pour the mercury into a porcelain dish and cover it. Prepare a solution of 1 part of sulphuric acid and 20 parts of water. Pour the acid into the water slowly, with constant stirring, never the water into the acid. When the solution has cooled, the barometer tube is washed with it, and then with clean water. Place the tube in a warm place to dry, with the open end up so that the vapor may pass off more easily. Next clean the mercury by forcing it through a piece of chamois skin, allowing the liquid to fall into a clean porcelain dish. This operation should be repeated several times.

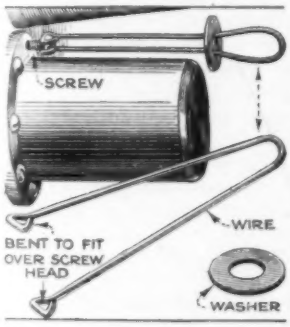
To refill the tube, pour a small amount

of mercury into the widened end, holding the tube downward at an angle and tapping it lightly to force the mercury down to the closed end. Air bubbles that may be formed while pouring in the mercury are removed by tapping the tube with a stick of soft wood, holding the tube down slightly while doing so, and tapping with considerable care to avoid breaking the tube.

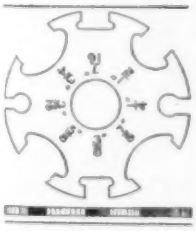
When the process has been completed, close the wide end of the tube with a cork or wadding. This sealing must not make the tube air-tight. If any mercury has been lost, add enough to make up for the deficiency, comparing the height of the mercury with that of another barometer of the same make.

Simple Screw Holder

Although there are a number of tools for starting screws in places that are nearly inaccessible, the tool shown in the illustration would be hard to beat for simplicity, and can easily be made, in a few minutes, from a length of heavy galvanized wire and a washer. The wire is doubled as shown in the lower detail, the ends bent over to fit the screw head, and the washer slipped over the doubled end, after which this end is widened to prevent the washer from coming off again. In use the ends are slipped onto the screw head, and the washer moved down to clamp the screw.



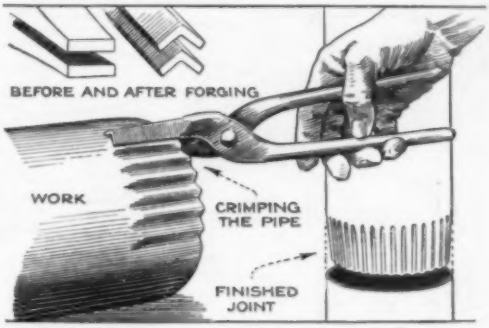
Handy Gauge for Machinists



A great deal of time is wasted by machinists in using calipers and micrometers to measure small work approximately. A gauge made similar to the common wire gauge, as shown in the drawing, has been found to be a valuable tool, as with it measurements can be made in a fraction of the time otherwise consumed.

Crimping Tool for Pipe

Anyone who has attempted to join two lengths of galvanized-iron pipe, when the end of one length is not crimped, will appreciate the homemade crimping tool

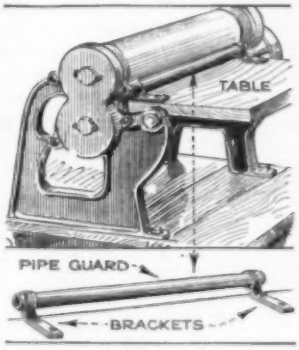


Homemade Pliers for Crimping Galvanized-Iron Pipe, Made from Ordinary Flat-Nosed Pliers

shown in the illustration. A pair of ordinary long-handled flat-nosed pliers was heated and the jaws forged to a V-shape, as shown in the detail. In use the crimper is simply pressed over the metal around the end of the pipe, which reduces the diameter, so that it can be pushed into the end of the other length of pipe.—G. A. Luers, Washington, D. C.

Guard for Mangle Rolls

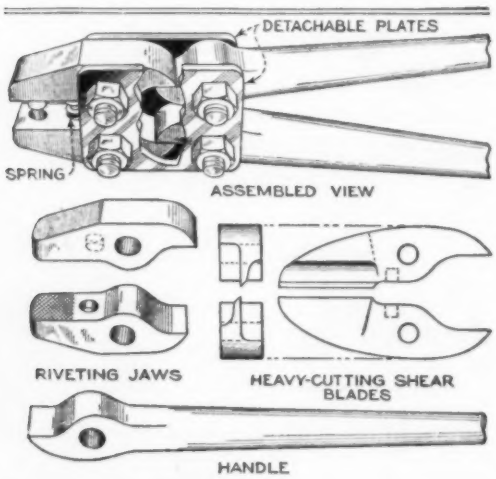
After a laundry worker had caught her fingers between the rolls of an old-style mangle, the machine was equipped with a safety guard, which made it impossible for similar accidents to occur. The guard consists of a length of ½-in. pipe supported at the end by a flat iron bracket screwed to the table as shown in the drawing. There is about ¼-in. space between the pipe and the table so that the work can be fed in between the rollers, but the fingers of the operator cannot pass the guard.—A. C. Cole, Chicago, Ill.



¶If oxygen or acetylene valves become frozen, thaw them out with hot water.

Combination Punch, Shear, and Riveter

Punch, shear, and riveter for heavy-duty work are tools that should be found in every mechanic's shop, but the cost



A Combination Punch, Shear, and Riveting Tool for Heavy Work That Can Be Made by Any Mechanic

of these makes a combination tool preferable. Such a tool is shown in the illustration. It consists of two handles and interchangeable shear blades, riveting and punching jaws, attached to the handles by means of two detachable plates and four heavy bolts as indicated in the upper figure, which shows the tool assembled. The handles and end members are made of square bar steel, which makes machining unnecessary except drilling, as the parts can be formed to shape by grinding. The side plates are made of ordinary steel plate. A small coil spring is provided between the jaws to facilitate using the tool. Several pairs of handles of various lengths should be provided to obtain different leverages.

Cementing Glass to Metal

For cementing glass to metal a mixture of sodium silicate and quartz meal, baking 12 to 24 hours to set hard, is recommended. If the color is unimportant a useful preparation may be obtained by soaking leather scrap glue in water, melting it by heat and then mixing it with 11 lb. of pitch, 4½ lb. of asphaltum and 4½ lb. of resin to each 1¾ lb. of glue solution. The mass may be loaded with powdered slate, etc., without losing its adhesive properties. An equally good cement is prepared by dissolving equal parts of russian glue and shellac, and adding levigated chalk. Casein cement, for immediate use, is made by mixing fresh curd with one-fourth its weight of powdered chalk; while a second preparation, which will keep, consists of a solution of casein in ammonia, or of a solution of the same material in a 5-per-cent solution of caustic soda or borax, with the addition of a very small proportion of hexamethylene-tetramine. This cement is impervious to water.

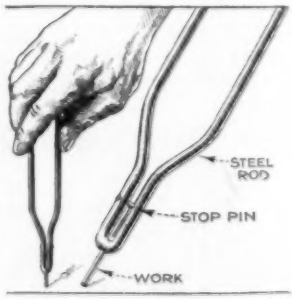
Resin adhesives are also used, the "amber" cement employed by jewelers being composed of three parts of mastic and two to four parts of shellac, dissolved to a "sirup" in 90-per-cent alcohol.

Oiling Automobile Springs

Old crankcase oil can be used to advantage for lubricating automobile and motor-truck springs and other parts of the chassis, the work being quickly and thoroughly accomplished by means of a small hand sprayer of the kind used for spraying orchard trees. The nozzle is equipped with a quick-acting valve and with it a fine stream of oil can be thrown in almost a straight line for about 10 ft. This method of oiling is a time and labor saver for garages as well as for private owners.—G. C. Douglas, Raleigh, North Carolina.

An Easily Made Pin Setter

The drawing shows a handy tool for setting pins in places where the fingers cannot reach comfortably. The dimensions of the tool depend, of course, on the diameter and length of the pin to be driven in, the one illustrated being made of 3/16-in. round stock, bent to the shape shown, and drilled in the end to take a pin. It is also drilled through for a stop pin, which fits tightly in one side and loosely in the other. In use, a pin is slipped in the hole at the end, until it touches the stop pin. Then by grasping the holder in the hand as shown, the pin can be pushed in place.



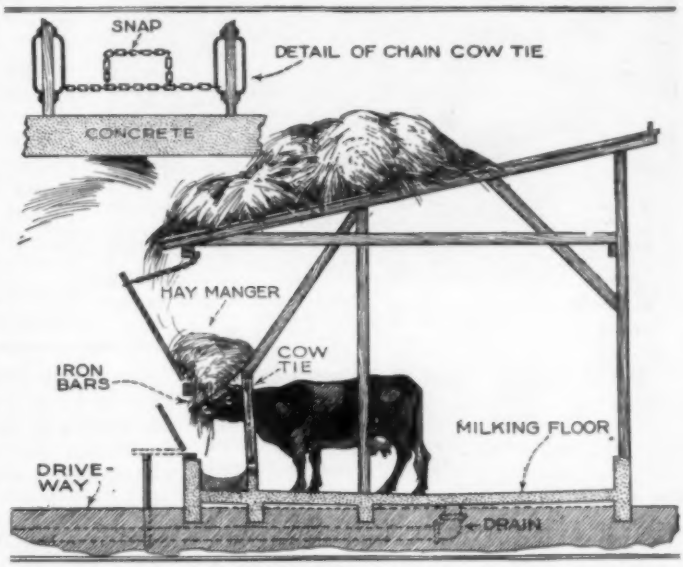
A Novel Dairy Barn

Milking and feeding go together, and therefore provision should be made to milk and feed at the same time. A novel dairy barn, which is arranged to permit this, is shown in the drawing.

The hay manger is located above the heads of the cows so that they have to reach up a trifle to pull the hay out; the bottom has a row of ½-in. iron bars to allow this. A hay manger of this type has the advantage of containing enough hay to last the cows for a number of days. The trap door of the hay manger hangs outward on chains and can be pushed back into vertical position whenever necessary, as in cold or stormy weather.

The grain manger is of the ordinary type, except that it is much larger and also lower. Both mangers can be filled from the outside, from a wagon or truck, the surplus hay being temporarily stored on the roof, ready to be raked into the manger when needed.

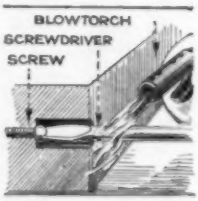
Another interesting feature of this dairy barn is the chain cow tie, which is an improvement on the stanchions usually used, as the cows have greater freedom to move their heads around, the bars permitting the chain to be moved up and down, but preventing the cows from moving backward.—Herbert A. Shearer, Eagle Rock, Calif.



Novel Dairy Barn with a Self-Feeding Hay Manger and a Large Grain Manger: It Also Has Chain Cow Ties, and a Concrete Milking Floor

Removing a Counterbored Screw

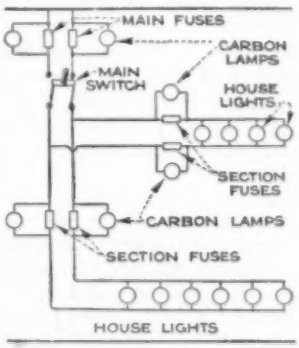
Having occasion to remove a screw that was set in a counterbore about an inch deep, and that had become "frozen" in and began to break up when the screwdriver was forced, I hit upon the idea of soldering the tip of the screwdriver to the screw and found it successful. By playing the flame of a blowtorch on the screwdriver as illustrated, the screw and the tip of the screwdriver were heated sufficiently to cause a drop of solder to melt and bind both together.—John F. Dwiggins, Petersburg, Tenn.



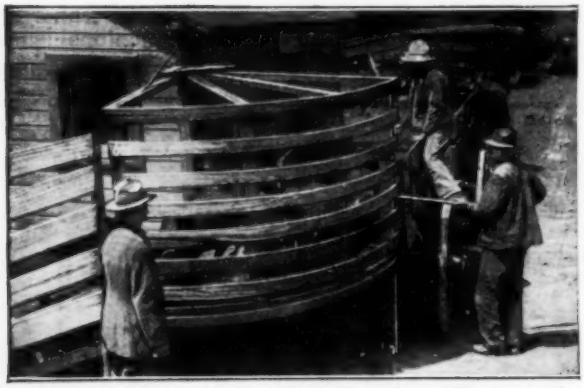
¶Ask the Bureau of Information where to obtain parts and materials mentioned in Shop Notes and Amateur Mechanics.

Lamps Indicate Blown Fuses

In places where fuses are often blown, it will be found convenient to shunt a carbon lamp around each fuse so that the lamp will burn when the fuse is blown. The lamps will not burn otherwise because the current can pass through the fuse much more easily than through the lamp, as the latter has a much greater resistance. The diagram plainly shows the method of connecting the carbon lamps.



Handy Chute for Unloading Hogs

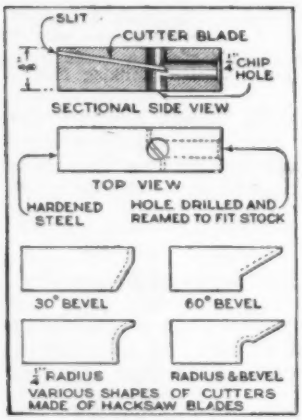


A Convenient Chute for Unloading Hogs from Wagons to the Pens at the Shipping Yards

The chute shown in the photo is in constant use for unloading hogs in a shipping yard at North Vernon, Ind. It pivots on the corner of a building, and the outside legs are fitted with small wheels, so that it can be pulled around easily. In use the chute is swung with one end against the back end of the wagon box, and the hogs driven through the chute into the pen. When not in use the chute is swung back against the building, closing the opening, and serving as part of the fence.—J. C. Allen, West Lafayette, Ind.

Bevel-Cutting Tool for Bar Stock

A handy and speedy tool for pointing, beveling, or turning radii on the ends of round stock, can easily be made and used on any type of lathe, combining in the smallest possible amount of metal a tool holder and guide for the stock. The cutting tools are made from power-hacksaw blades that have been broken or worn out, the holder being made from tool steel, drilled and reamed out to fit the stock being worked. A diagonal slit is then sawed with a hacksaw blade that has had the set of the teeth ground off to the thickness of the blade section. In use, the cutting edge of the tool is turned down, causing the chips to drop and prevent clogging. The inclination of the slot serves the double purpose of permitting an easy clamping action of the holder in the turret, and at the same time presenting the tool at an easy cutting angle. The holder should be hardened to prevent undue wear on the guide section.

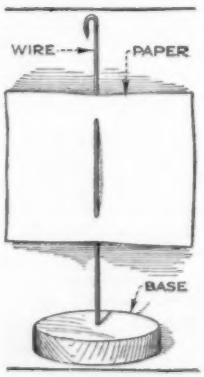


Blades of various shapes for different classes of work are easily ground from pieces of power-hacksaw blades on a fine-grained wheel.

On speed-lathe work, it has been found best to hold the tool in the chuck of the headstock spindle and allow it to run continuously, holding the work in a drill chuck in the tailstock spindle.

Stand for Light Testing Work

White paper makes an excellent background for testing work by the light method. In the illustration a stand is shown that was made especially for this purpose. This stand holds the paper so that it can be slid up and down to suit the operator, and also be turned around to any position to reflect the light. The base of the support is a slab of round stock, in the center of which is driven a length of ⅛-in. wire, sharpened at one end and bent over as shown, to eliminate the chances of an accidental scratch. When using squares, center gauges, straightedges, or similar tools used for testing the shape of work this stand will be found to be of considerable assistance, as it does away with the necessity of setting the paper up against different objects to obtain the correct light.



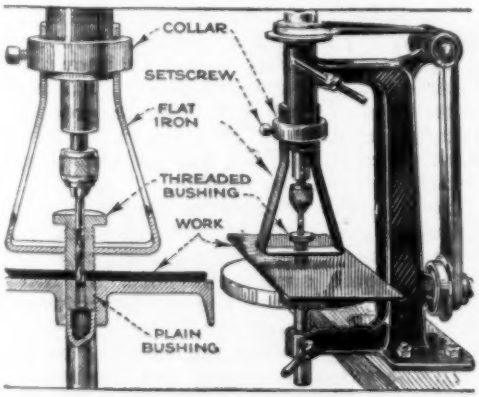
¶Steam rising from water at the boiling point has a pressure equal to the atmosphere, 14.7 lb. per square inch.

Drilling Fiber

A small shop order called for the drilling of a large number of soft fiber sheets. The holes were laid off and prick-punched in the usual way, but trouble arose during the drilling in that a ragged burr was formed on both sides of the holes and attempts to remove it merely resulted in a much worse looking hole.

To overcome the trouble, a fixture of the kind illustrated was attached to the drill press. It consists of a piece of flat iron, a collar, and two bushings, one threaded and the other plain. The plain bushing is a tight fit in the hole in the center of the drill-press table, and the threaded bushing screws into a tapped hole in the flat iron, which is bent to the shape shown, and clamped to the drill-press spindle by a collar and set-screw. Thus the entire surface of the table is clear of any obstruction and the work can be moved around as freely as if no fixture were used.

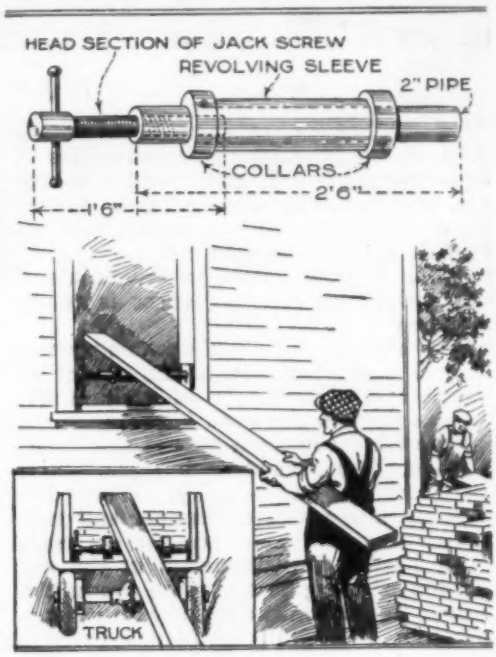
In operation, the flat-iron bracket is held about 1 in. above the surface of the work; then with the drill revolving in the hole of the threaded bushing, the spindle is brought down until the drill point enters the punch mark. The threaded bushing is then screwed down tightly on the work and the hole is drilled. With the work thus held tightly between the two bushings, a clean-cut hole can be drilled. The threaded bushing is turned back only a couple of threads when changing the position of the work—just enough to allow the operator to see when the drill point enters the punch mark, so that operation of the device does not by any means slow up the work.



Fixture on the Drill Press for Drilling Holes Through Soft Fiber without Burrs

Roller for Handling Lumber

The roller support for handling lumber shown in the drawing is of considerable assistance in many places, as it can be placed in a door, window, between girders and studdings, or on a truck. It has the advantages of being both simple and adjustable, and can be used without any stays or props.



A Simple and Adjustable Roller Which Is of Great Assistance in Handling Lumber

The upper detail shows its construction and gives the dimensions. It consists of a jack fitted with a revolving sleeve on which the lumber is rolled. The jack is made of a screw, threading into a length of strong 2-in. pipe, and is fitted with a pipe cap and a handle for turning the screw. The revolving sleeve is a shorter length of pipe or steel tubing, and fits loosely between two collars tightened on the jack.

¶ When a wooden post or brace is to be set on a smooth concrete floor, it often becomes a problem how to make it stand securely without the danger of slipping. If two or three ½-in. holes are chiseled in the concrete and nails driven into the bottom of the post, until about ½ in. of the head end is exposed and in such a position that they will project into the holes in the concrete, the post will not slip.

CHIPPED-GLASS WORK

BY J. S. HAGANS

MOST of us, at some time or another, have seen some examples of chipped-glass work, and wondered how the fanciful designs were made on the glass. The process is a simple one, although demanding just the right combination of temperature and materials, if the desired richness of effect is to be obtained.

A brief description of the whole process at this point will enable the reader to understand the purpose of each of the various steps in the work later on. First, the glass is roughened on the side to be chipped, then coated with thick, warm glue, and laid away to dry. When dry, it is put into a closed chamber and subjected to a fairly high degree of heat; when heated, the difference in the expansion of the glue and glass causes the former to chip off, bringing with it fragments of glass. The result is a pattern, of wonderful design, chipped into the surface of the glass.

It is absolutely necessary that the surface of the glass to be worked upon be roughened, to afford a "foothold" for the glue; smooth glass cannot be chipped, because the glue cannot obtain a grip, and flakes off without affecting the surface of the glass in the least. The quickest and most thorough way to roughen the glass is by means of the sandblast, as shown in Fig. 1. Sandblast apparatus of various forms, suitable for this work, was described on page 464 of the March, 1923, issue of this magazine. If compressed air is not available, or the amount of work is small, the glass may be roughened with sand and water, applied by means of a block, as shown in Fig. 2. This part of the work need not be done with any particular care, because scratches, unless very deep, will be obliterated in the finished work.

The next step is to apply the glue. A good grade of glue is soaked overnight, and melted in the morning to make a rather thick liquid. This is applied to the rough surface of the work with a broad brush, as in Fig. 3, so that every part of the surface is covered with a layer of glue about 1/16 in. thick. This done, the glass is laid away on a level surface and allowed to dry at room temperature. The consistency of the glue used must be found by test, but only the best glue obtainable should be used, and a thick solution applied to the work.

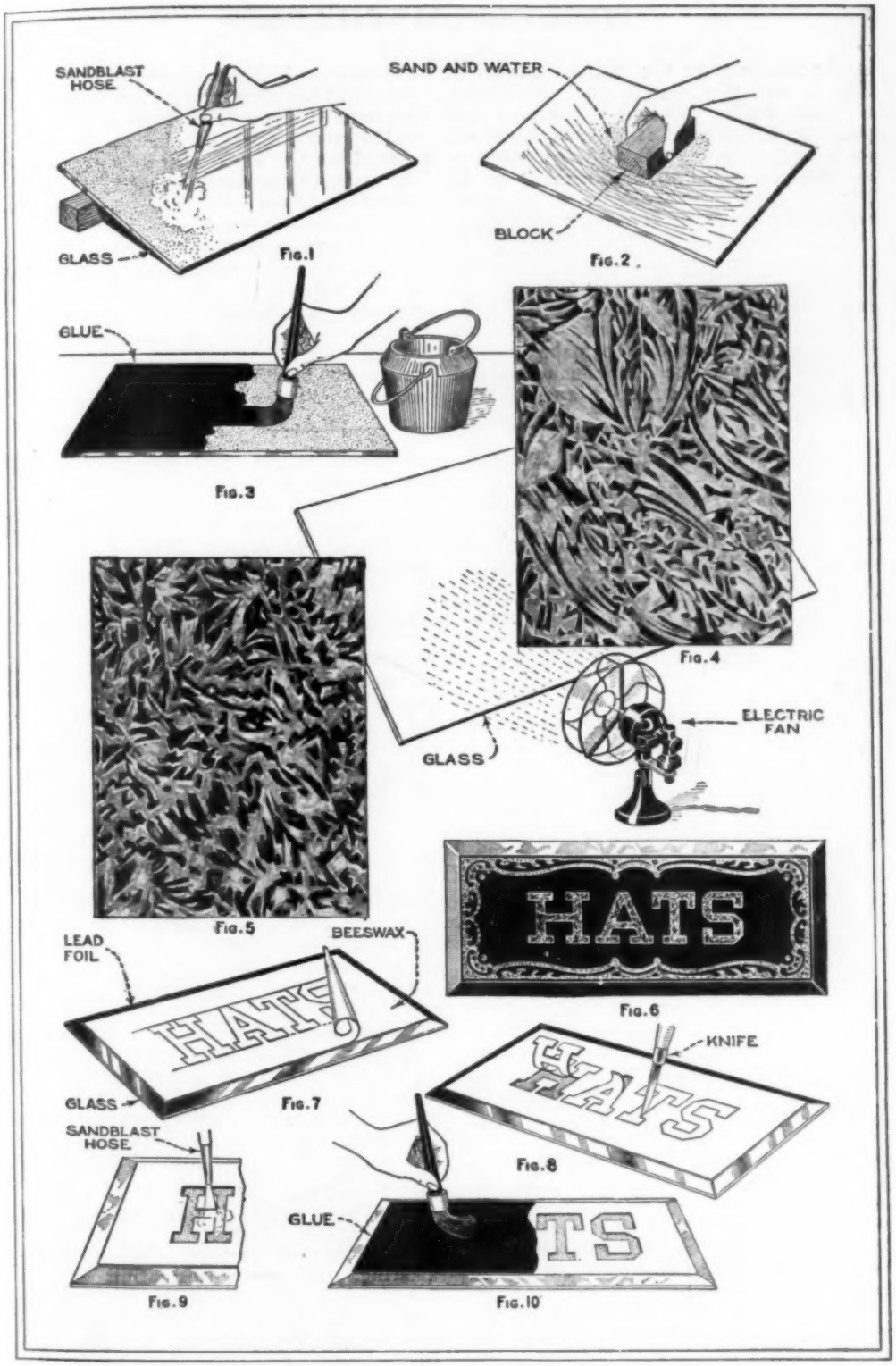
In some cases, the glue will begin to chip and fly off at room temperature, and the process can be expedited by playing the breeze from an electric fan over the sheet. If the glue dries out thoroughly without showing any signs of chipping, the process can be started by the application of heat. The glass is placed on edge in an oven, and the temperature run up as high as necessary to start the chipping, being careful, of course, to guard against fire through overheating. If the glass is too large for any oven available, a simple sheet-metal oven for containing the glass can be built to be set on a stove. It might be noted here that double-strength glass should be used in this process, as the lighter single-strength glass is apt to be broken by the tension created, especially in large sheets.

Assuming that the result has been satisfactory, the sheet now bears the appearance shown in Fig. 4, and is known as "single-process" chipped glass. If a finer pattern is desired, the "double process" can be used; this consists in applying another coat of glue to the glass, and treating exactly as before.

So far, the process is simple, and a solid-chipped sheet of glass is produced, such as might be used in an office door, or for some similar purpose. A little more care and work are necessary when an advertising sign, such as shown in Fig. 6, or any similar job, is to be made.

In the example shown, the letters and the scroll are chipped, the rest of the panel remaining clear; for this particular job, good plate glass should be used.

The glass is slightly warmed, and given a thin coating of beeswax; then, still keeping the glass warm, a sheet of lead foil, or even thin, tough brown paper, is rubbed down into close contact with the waxed surface of the glass. The design



Various Steps in the Making of Chipped Glass, Both Simple Sheet and Ornamental Work: The Process Is Simple, and the Work May Be Done in a Small Shop

is then drawn on the foil, as shown in Fig. 7, and the outline gone over with a sharp knife. The foil covering the parts to be chipped is then stripped off as indicated in Fig. 8, and the work is sandblasted through the stencil, as in Fig. 9. Next, the work, with the stencil still in position, is coated with glue, Fig. 10, after which the remainder of the stencil is stripped off. From this point on the treatment is exactly the same as for the plain sheet.

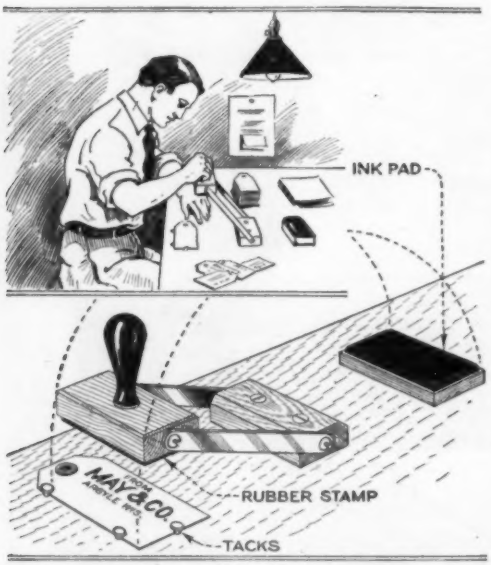
Signs of this kind are usually backed with gold or silver leaf, to make the letters stand out to the best advantage, and they have an unusually rich and striking appearance because of the refraction of the light striking the bright metal leaf through the rough surface of the glass.

The plain part of the glass can be coated on the back with some free-flowing paint that contrasts with the leaf; green and red are the colors usually chosen for this work.

Very fine results can be obtained by a combination of sandblasting, as described in the issue previously referred to, and chipping. This method requires two separate stencils, and the sandblasted part of the design is done first. This part is protected by the second stencil, which exposes only the parts to be chipped.

Stamping Tags Quickly and Neatly

A shipping clerk in a small factory, who had a large quantity of shipping tags to stamp with an ordinary rubber stamp, found the work quite tedious on account of the difficulty of holding each tag so that the printing could be stamped squarely on it. To simplify the work, he constructed the attachment shown in the drawing, and found that its use effected a considerable saving of time.

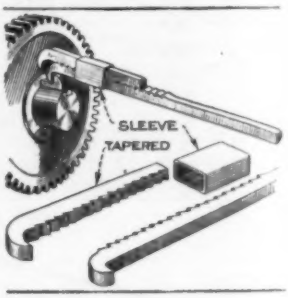


A Convenient and Time-Saving Attachment on a Bench Top for Stamping Large Quantities of Cards

A small block, the same length as the stamp, was fastened on the bench top, and two 6-in. iron straps were drilled at the ends and screwed loosely to the block and to the stamp, so that it could be swung back and forth from the ink pad at one side to the tag at the other side. Tacks, partly driven into the bench top, were used as stop pins to locate the tags quickly in the proper position for stamping.—G. E. Hendrickson, Argyle, Wis.

Adjustable Pinch Bar Pulls Gib Keys

The illustration shows an adjustable pinch bar for pulling gib keys. When using an ordinary puller it is necessary to put a block behind the head as soon as the key is pulled out a short distance, but, with the puller shown, the use of a block is eliminated. The attachment consists of a tapered piece, with teeth or serrations engaging with similar teeth on the back of the pinch bar. A sliding collar holds both parts together securely, and prevents either from moving when in use. The collar is slid toward the handle when the parts must be set for another "bite."



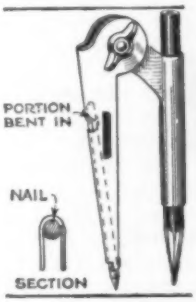
Pattern Color Denotes Material

A simple and practical method of indicating, for the information of the foundryman, the materials from which parts are to be made is to have the different materials indicated by the color of the patterns, a color chart being provided for reference. With this method it is possible to avoid mistakes and to

prevent the delay necessary to trace the pattern back to the original drawing. A color scheme of this kind, which was found to be of considerable assistance in a foundry, is as follows: Black for cast iron, gray for steel, yellow for brass, red for copper, and white for aluminum. The color used on the pattern was as close to the natural color of the metal as possible.

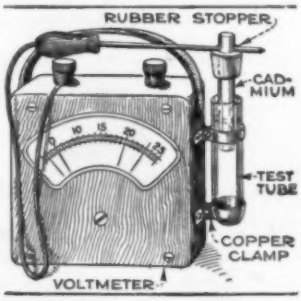
Improving Carpenters' Compasses

Carpenters are often annoyed by the loss of the screw that clamps the adjustable point of their compasses. A simple method of eliminating this trouble is as follows: Just above the screw slot make two hacksaw cuts ⅛ in. apart and ⅛ in. deep, and another cut about ⅛ in. from the end of the leg. Bend the cut portions downward and slip through these loops an 8-penny nail, from which the head has been removed, and with the point sharpened. On many forms of work an ordinary carpenters' pencil can be substituted for the round-pointed pencil, with the advantage that the lead does not wear so quickly.



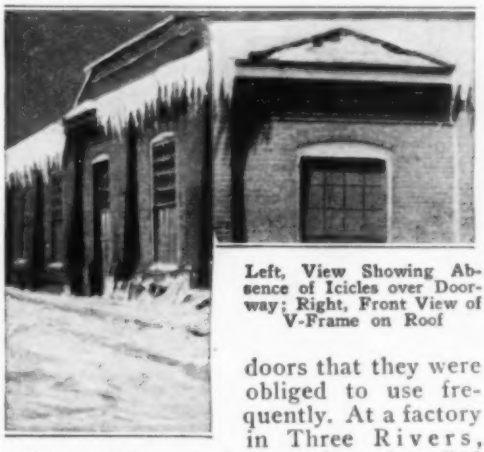
Protector for Cadmium Sticks

In making storage-battery tests with the aid of cadmium, it is usually necessary to have a jar of water handy in which to immerse the cadmium, as it does not deteriorate as quickly in water as it does in air. Rather than carry a separate jar around with the voltmeter, it has been found convenient to attach a test tube to the side of the voltmeter as shown in the illustration. The cadmium stick is fitted with a rubber cork so that the water in the test tube will not be spilled while carrying the voltmeter around.—J. B. Burnett, Vinita, Okla.



Guard over Door Prevents Danger from Icicles

Many instances have been recorded where workmen in factories have been injured by icicles falling from eaves over doors that they were obliged to use frequently. At a factory in Three Rivers, Mich., safety guards have been installed over all doors to various buildings throughout the plant, and have proved effective in preventing the formation of icicles of any size. The guard consists merely of two pieces of 4 by 4-in. timber, placed in the shape of an inverted V, and nailed to the roof directly over the entrance or door. A strip of roofing paper is nailed to the roof and against the upper side edge of the V-frame, forming a flashing to deflect the drippings to either side of the doorway. During warm weather, when there is no ice or snow, the guard serves as an eaves trough, deflecting the rain away from the doorway.



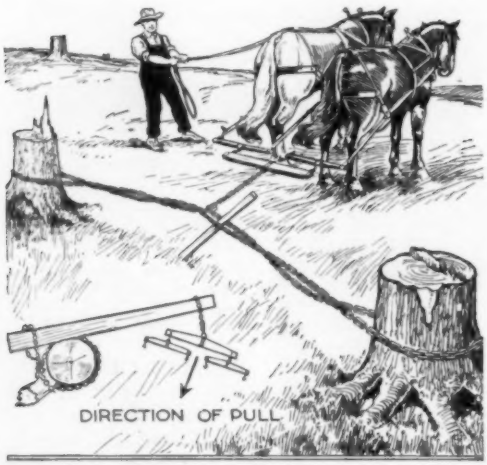
Left, View Showing Absence of Icicles over Doorway; Right, Front View of V-Frame on Roof

How to Clean Tools

To keep tools clean and bright rub a little mercurial ointment over them, which will form a moisture-resisting coating. Mecurial ointment is also known as blue butter. It is somewhat poisonous, so should be handled carefully. Another good mixture to keep tools from rusting is made by taking six parts of lard and one part of resin. Heat these together slowly until the resin is all melted. The mixture should be heated in the open air in case of fire, and benzine added in about the proportion of one pint of benzine to half a pound of the mixture. When cool, the mixture can be rubbed lightly over the bright-steel articles. Tools thus treated will resist the corrosive action even of salt water.

Pulling Stumps

In pulling stumps I find that a team and one or two long chains will do the work effectively if arranged correctly.



An Effective Method of Pulling Stumps by Means of a Heavy Chain and a Team of Horses

The greater the distance the stumps are apart, the easier they can be pulled.

When two stumps are situated close together, loop the chain around each stump and hook it. Twist it by means of a lever to get it as tight as possible, and hook the team on as shown. In case there is no other stump to hitch to, dig down so as to expose the main root, and, after fastening one end of the chain, wind it around the stump, and under the root, providing a loop large enough for a 10-in. pole. This pole should be about 20 ft. long and the team is hitched at one end as indicated in the left-hand detail.—E. R. Booth, Edwardsville, N. Y.

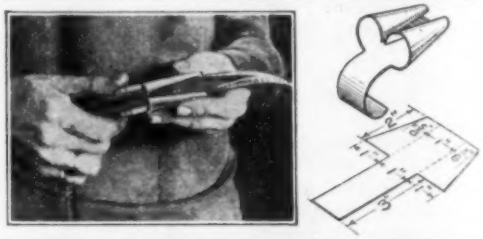
"Oxidizing" Copper and Brass

The antique finish so much admired in fixtures, hinges, trays, etc., known also as "oxidized" work, is produced on both copper and brass in exactly the same way. The process is cheap and simple. A strong solution of potash and lye, using about two tablespoons to a quart of water, is first made. A second solution consisting of about 2 oz. of sulphide of potash and two quarts of water, is then prepared. After fastening a short piece of wire to the article, to serve as a handle, the article is dipped into the first solution to remove all the grease and dirt. It is then rinsed in hot water and dipped into the sulphide solution until it has a good, sharp-black color in the case of a copper article, and a grayish black in case of a brass article. It is again rinsed in hot water and hung up to dry. When thoroughly dry, it is buffed all over lightly on a soft cloth buffing wheel, then buffed so that the copper will show through in spots to produce the desired effect. A little practice will enable one to buff a piece so that it will look as well as if done by an expert.—E. R. Haan, Chicago, Illinois.

Trimming Spreader for Upholsterers

Automobile upholstery of the better grade is trimmed with tape that rolls back on itself, after tacking, to conceal the tacks. As it is rather difficult to hold the trimming flat while nailing, the spreading tool shown in the photograph has been found useful for this purpose.

A piece of galvanized iron about 4 in. long and 3 in. wide is cut to the shape shown in the lower right-hand detail. The narrow tongue is curved to form a handle and the tapering projections bent to form cones. In use the tape is fed into the large ends of the cones and is drawn out through the narrow ends, causing the edges to roll apart, thus exposing the



A Tool for Spreading the Trimming Tape Used on the Better Grades of Automobile Upholstery

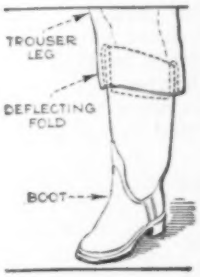
center for tacking. The trimming closes again after the tool is drawn a few inches further.—Edwin M. Love, Alhambra, California.

Restoring Overexposed Blueprints

A simple method of restoring overexposed blueprints consists in taking the print from the washing-tank and laying it face upward, while still wet, on the table, then placing an unexposed dry piece of blueprint paper of the same size over the wet one, and rubbing it with a piece of cloth or with the hands. This brings the two surfaces into intimate con-

tact, and when separated, it will be found that the overexposed print is perfectly clear and of a rich blue color. The color obtained in this way is better than that obtained by the ordinary exposure and development, but there is, of course, the objection that a piece of blueprint paper is wasted for each print made.

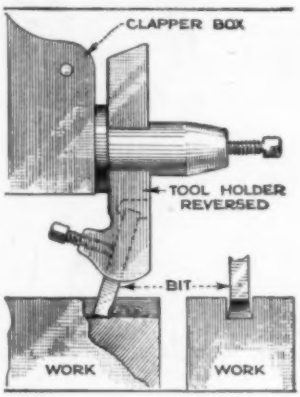
Keeping Dirt from Boots When Excavating



When excavating trenches, the worker's boots collect loose dirt and stones, which makes it very uncomfortable for him and makes it necessary to remove the boots frequently. This trouble may be prevented by folding the trouser leg over the boot so as to overlap about 3 or 4 in. as shown. This lap prevents the passage of dirt into the boot.—Louis Schneider, Clinton, Mo.

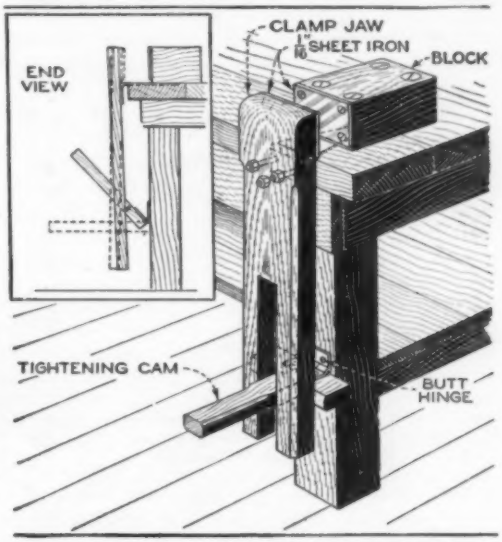
Planing Deep Grooves

Every machinist and toolmaker knows what a tedious job it is to machine a deep rectangular groove in metals, particularly in brass or steel, with the ordinary tool holders on the planer or shaper. These tool holders carry the tool bit at an angle that gives the nose a positive rake, which is very good on plain work, but in grooving work, where a wide, square-nosed tool is used, it tends to dig in and break off. By reversing the tool holder—that is, by using it backwards — the bit is given a negative rake. Of course, the bit must be re-ground so that the nose has a good cutting lip, and it will then do good work, taking a fairly heavy cut, and tending to spring away from the work, rather than to dig into it.—George A. Volz, Redford, Mich.



Useful Clamp for the Woodwork Bench

The drawing shows a simple homemade clamp that is of considerable usefulness to woodworkers. It consists of a wooden block, securely screwed to the benchtop in the position shown, and faced on one side with 1/16-in. sheet iron. This forms the permanent jaw. A 2 by 4-in. lever, also faced at one end with sheet iron, and slotted at the other end as shown, is arranged to pivot on a strap hinge that is screwed to the benchtop and bolted to the lever at the point indicated. The upper end of the lever forms the movable jaw. The vise is tightened by means of a 2 by 4-in. cam, attached to the bench leg with a butt hinge, the narrow part of the cam fitting in the slot of the lever and extending outward about 6 in. so that it can be operated by the foot. Forcing the cam lever downward brings the vise jaws together, clamping the work between them. If the object is too small to be held between the jaws, one or two small wooden blocks are put between it and the jaws.



A Simple Foot-Operated Bench Clamp of Considerable Usefulness to the Woodworker

Cleaning an Oil-Soaked Belt

To clean an oil-soaked belt, coil the belt loosely in a box or tub and fill the box with whiting, being sure to get the whiting between the surfaces for the entire length. Let it remain thus overnight, and the whiting will absorb the oil and leave the belt clean.

A Lesson for Patternmakers

BY M. E. DUGGAN

WHEN I say that a pattern was molded in green sand, with a dry-sand core, and that the core was made without the aid of a corebox, the patternmaker who has had foundry training

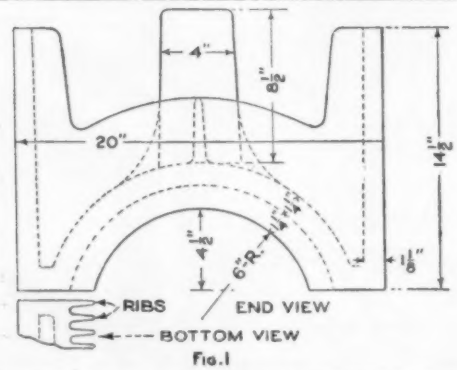


Fig. 1

Piece That Was Cast in Green-Sand and Dry-Sand Core without Corebox

readily understands, but the patternmaker whose training was received in a shop far from the foundry looks at me with astonishment, and wonders how it was done. The young patternmaker will therefore appreciate a clear description of this detail of patternmaking and foundry practice.

The pattern selected for illustration was made by a worker who had a number of years' experience; he constructed it for green-sand molding, which, by the way, was impracticable in this case. When the casting was made, and the patternmaker was told that the job was done "in green-sand and dry-sand core" he thought that there was something wrong with the foundry, as he was positive that no corebox had been made for the job.

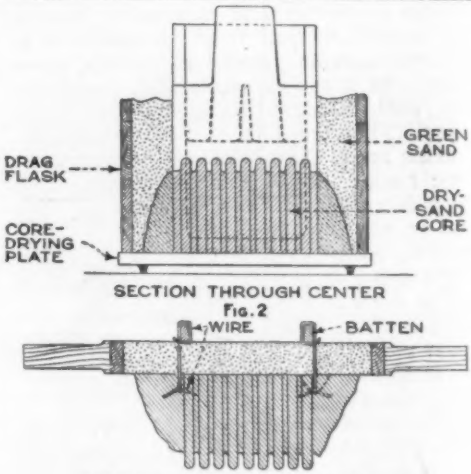
A side view of the work is shown in Fig. 1; it was made with ribs ⅜ in. thick at the bottom, tapering to ¼ in. at the edge, and 1¼ in. deep. A section through the center is shown in Fig. 2. The pattern was molded with the ribs up; the piece could not be molded in green sand because the sand could not be made secure and would drop when the cope was being closed down on the drag, and the thin ridges of sand forming the spaces between the ribs would be "washed" away in the closing of the mold. For these reasons the molder decided to use a dry-sand core.

With the pattern inverted, core sand was rammed in between the ribs, the pattern was then turned "right side up" on a core drying plate, and core sand filled in below and around it as indicated in Fig. 2; the pattern was then lifted from the sand core and the core baked.

Pieces of bent wire were imbedded in the core before baking, and, after baking, the sand above these wires was cut away to allow other wires to be passed under them. Then the core was taken to the molding floor and the core and pattern put back in the position shown in Fig. 2, except that a bottom or molding board was used instead of the iron core-drying plate. Drag flasks were then put in place and green sand filled in as shown, completing the drag.

The drag, with the pattern, core, and bottom board was then rolled over to receive the cope flask, in this case what is known as a "flat back"; this molding method makes it possible to use almost any flat cope flask.

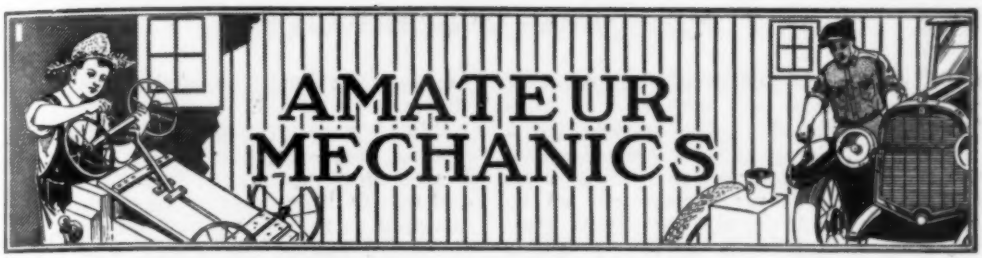
When the rolling was done, the bottom board was removed, and the cope flask placed in position. Two wooden battens were placed across the cope flask, as



Above, Preparation of Drag; Below, Dry-Sand Core Forming Cope

shown in Fig. 3, and the core tightly drawn against the cope by means of wires passed under the wires in the core, and around the battens.

The cope, with the core attached, was then lifted, the pattern removed from the drag, the cope replaced and clamped, and the mold was ready for the iron.

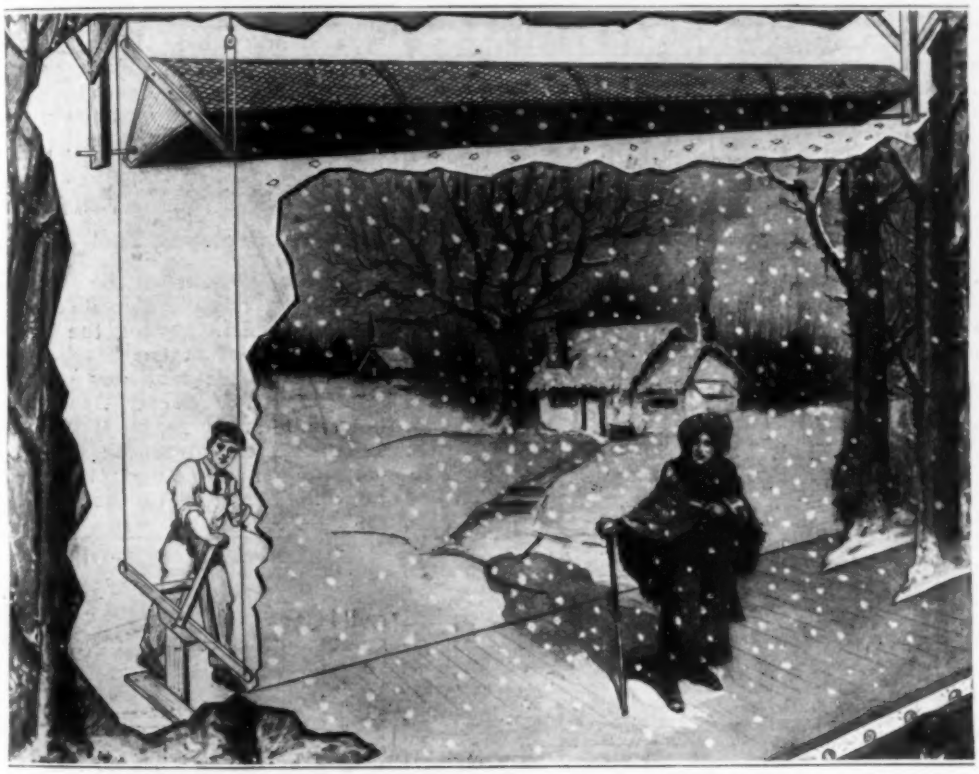


A "Snow Box" for the Amateur Stage

BY L. B. ROBBINS

DEVICES intended to imitate the falling of snow upon the amateur stage are many and varied, but few are completely satisfactory. Either the fall of "snow" is limited by the small supply of the pieces of paper used to create the illusion, or the spread of the snowfall is far too small for the scenery required.

There is one device, however, that can be made by anyone handy with tools, and that has been in successful use on many professional stages for years, especially abroad. For the amateur's use this "snow box" has been simplified, and, as shown in the illustration, will serve to spread a snowfall over the visible portion of a small stage. Moreover, it holds a supply of material large enough to last, with judicious use, for many minutes, so that a long scene can be staged without the snowfall abating in the least.



A Simple and Effective Attachment for the Amateur Stage for Giving the Effect of a Heavy Fall of Snow: The Box Holds a Large Supply of Paper, and Is Easy to Operate

The necessary length of this snow box will, of course, depend upon the size of the stage, but for general use a 12-ft. box will be ample to cover any space not hidden by scenery, and should do for any small school, lodge, or society stage. The sides can be made of 12-ft. boards, 18 in.

wide, or several boards cleated together to make a side this width. The ends should be shaped to the segment of a circle, 18 in. along the sides, curved across the top edge, which measures 15 in. wide, and the point at the bottom cut off so that it measures about 2 in. wide. Nail the sides to these ends so that a box is formed as shown in the drawing.

Nail a 12-ft. length of 3-in. furring along the bottom, over the opening left by the bottom edges of the sides. Fit two or three barrel hoops in the top opening, curving them to correspond to the curve of the tops of the ends. These act as spreaders and serve to keep the screening which covers the top at the proper curve. This screening should be preferably 1-in. mesh chicken wire, tacked over the entire top opening of the box.

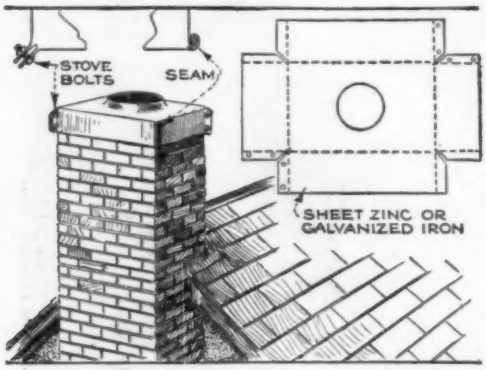
The box is then swung at each end by bolts run through the ends as shown. The ends of the bolts are run through holes in the ends of timbers placed over the stage well up and out of the way. Suspend the box horizontally in this manner over the open part of the stage where the snow is to fall.

The box is operated by means of a tipping lever—a stick nailed across the top of one end. Cords fastened to each end of this lever pass up through pulleys attached to the ceiling and then down to the stage behind the wings, where they are fastened to a rocking lever made as shown in the drawing. Nothing elaborate is necessary for this lever, but it should be supplied with some sort of a handle so that it can be operated by a stage hand from a good vantage point.

When the box is filled with paper bits and then rocked from side to side some of these bits fall out and to the stage in imitation of real snow. An electric fan behind the wings at one end of the stage will blow the falling snow as though driven by a strong wind. If desired, a link from a large flywheel driven by an electric motor can be arranged to rock the snow box by power, so that the stage hands can attend to other duties during the "storm."

Zinc Makes Durable Chimney Caps

Brick chimneys are apt to break and become loose at the top, due to weathering, and the loose bricks are very dangerous, especially during high winds.

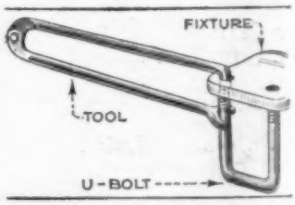


A Metal Cap for the Chimney Top Prevents the Bricks from Becoming Loose

This danger can easily be prevented by providing a cap made of sheet zinc, cut to the shape shown in the illustration and fitted on the chimney, brass bolts being used to tighten it. The edge of the circular hole is bent upward to shed water. The cap can be put on by anyone who can use tools such as tin snips and hammer. Heavy galvanized iron can be used for the cap, but zinc is more durable.

A U-Bolt Replacing Tool

When replacing U-bolts on the springs of an automobile, considerable difficulty is often experienced in getting the bolts in line with the holes in the bracket or fixture, because of the tendency of the bolt to spread apart. A great help in lining up these bolts is the simple tool illustrated. It consists of two lengths of iron rod, hinged together at one end; the other end of one rod is bent to fit in the bracket hole, and a fork is forged on the end of the other. The forked rod is held against one side of the U-bolt, while the bent end is inserted in the hole of the bracket as shown. With one leg of the U-bolt already located in position, it is an easy matter to force the other leg into place with a few light blows of a hammer on the hinged end of the tool.—Glen F. Stillwell, Collinsville, Ill.



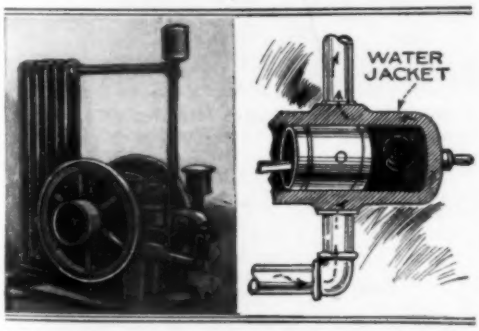
¶A radiator hose usually begins to leak on the underside. By loosening the clamps and turning the hose around, so that the underside will be on top, it will serve twice as long.

Horseshoe Wrench for Oil Barrels

When one is in a hurry to fill an auto or tractor fuel tank, it is quite annoying to wait for the liquid to gurgle out of the faucet gradually, as is usually the case. Of course, if the upper cap is unscrewed so that air can enter, the flow is increased considerably, but unfortunately the caps of standard 50-gal. barrels are made round, with a square recess in the center, so that an ordinary wrench cannot be used to unscrew them. A pipe wrench can be used on the outside, but a pipe wrench is not always at hand. A horseshoe has been found to be a very convenient tool for unscrewing the cap. One calk is inserted in the slot, as shown in the illustration, and the cap can then be loosened with a single twist.—G. E. Hendrickson, Argyle, Wis.

Heating Radiator Cools Engine

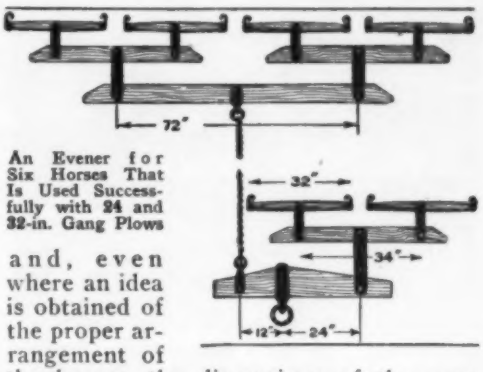
A farm gasoline engine, on which the water hopper had been broken by freezing, was not put out of service by this mishap, but was cooled by means of an ordinary heating radiator; this hookup, although novel, proved very efficient. The method of connecting the radiator to the water jacket is plainly shown in the photo and detail. A high radiator is best to use for this purpose, as there is a greater distance between the top and the bottom than there is in a small window radiator, and this induces a constant and steady circulation of water.—Dale R. Van Horn, Walton, Neb.



A Novel Cooling System for a Gasoline Engine Making Use of an Ordinary Heating Radiator

Six-Horse Evener for Plow

Farmers are often puzzled as to the proper method of making an evener to be used for six horses when plowing, and, even where an idea is obtained of the proper arrangement of the horses, the dimensions of the arms are still puzzling.

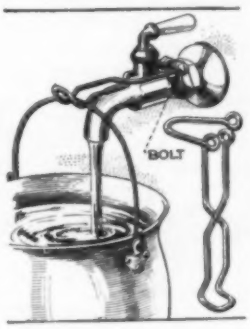


An Evener for Six Horses That Is Used Successfully with 24 and 32-in. Gang Plows

The illustration shows, in plan, an evener that has been used for years with success, on 24 and 32-in. gang plows. The four and two-horse eveners used are standard size, and the main-evener member is the same length as the standard three-horse evener. The right-hand lead and wheel horses walk in the furrow and guide the plow.

Kettle Holder on Faucet

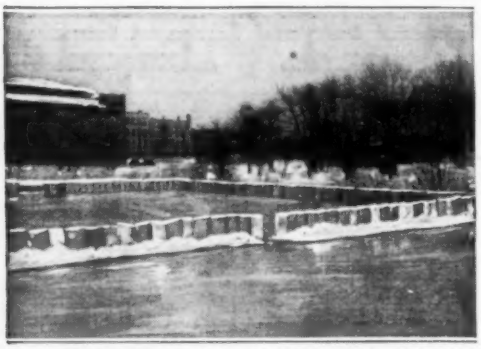
The illustration shows a length of heavy galvanized wire, bent to form a holder that is attached to the kitchen faucet, so that steaming kettles may be hung on it to avoid burning the hands. The wire is bent to the shape shown in the detail and to a size determined by the faucet on which it is to be used. After it is fitted on the faucet a stovebolt is passed through the eyes formed in the wire, and is screwed up tightly.—Harold E. Benson, Boulder, Colo.



¶ Never neglect attending to auto rear-axle noises; the rear axle is a very hard-worked piece of mechanism, and should therefore have the best of care. Have any noise investigated immediately.

Ice-Block Fence for Hockey Field

The photograph shows a hockey field inclosed with blocks of ice, which cost only one-third as much as a wooden fence

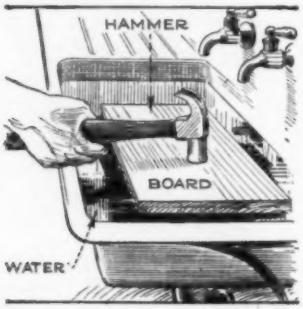


An Ice-Block Fence for a Hockey Field Is Just as Good as a Wooden Fence and Is Much Cheaper

for the same purpose. The blocks were about 20 in. thick, 40 in. long, and 22 in. wide. They were set on end, as shown, with the 22-in. sides lengthwise of the fence. Wet snow was packed between the blocks and the whole fence then sprinkled with water, which froze the blocks together. The section inclosed was then flooded, and this, upon freezing, also held the blocks together more securely. Slight thawing spells had little effect on the fence.—C. L. Meller, South Fargo, N. D.

Cleaning the Sink

There are numerous methods of cleaning sinks, but many of them are not effective. A simple method of doing the work effectively is shown in the illustration. The sink is half-filled with water, and a wide 1-in. plank about 1 or 2 ft. long is laid on the water. Standing aside to avoid being splashed, the operator strikes the board a few hard taps with the hammer, with the result that the pipe is cleared by the transmission of the blow through the water, which dislodges the obstruction. This method will always be found effective, provided the obstruction is not too large to be forced through the pipe.



Repairing Marble Clocks

Marble clocks are built up of a number of pieces of marble cemented together, and these are liable to fall apart when the clock is old. A simple and durable repair is to scrape off as much as possible of the old cement and use plaster of Paris, mixed with water to join the pieces together again. It may be necessary in some cases to drill a number of ⅛-in. holes in the edges of the pieces to anchor the cement securely, or to drill smaller holes, and bind the pieces with wire hooks in addition to the cement.

A Strong and Simple Bridge

The photograph shows a strong and simple footbridge used over a gully on a western golf course. It is made of two strong planks, one a little shorter than the other. A cleat, 10 in. wide, is nailed between them in the center, and a 6-in. cleat near each end. The ends of the short plank are securely nailed to the

A Strong and Simple Bridge Made from Two Planks, Used across a Gully on a Western Golf Course

underside of the larger one. The bridge, so constructed, will support a dead weight of 1,000 pounds.

Test for Sodium Carbonate

Many photographers make up their stock solution of sodium carbonate and sodium sulphite in similar bottles, and as the labels of these bottles become dirty or are torn off very easily, it is sometimes impossible to tell which solution a particular bottle contains. A good method of finding out is to pour a small quantity of either liquid into a measuring glass and add a small crystal of citric acid. If a constant stream of bubbles issues from the crystal until it is dissolved, the solution is sodium carbonate, but if there is no action, the solution is sodium sulphite.

Dale R. Van Horn, Walton, Neb.

any noise investigated immediately.

Part III—Inner Tube Repairs

THERE are few car owners who have not made repairs on inner tubes and it is equally true that there are but few drivers who have not had a tube repair fail on some particularly hot day. Many of the tube-repair failures can be avoided, for it is usually the workmanship that is at fault. A correctly applied patch will make the repaired section of the tube fully as strong as any other part.

Two methods of making tube repairs are in common use: the cold-patch repair, which needs no heat, and is often used for emergency repairs, and the repair by vulcanization, which requires heat to cure the patch. Many car owners prefer the vulcanized repair, holding that there is less chance of failure with this method.

The tire-repair shop makes use of heat from steam to vulcanize repairs, or, in some cases, the heat from an electric tube plate. While the car owner will have neither of these pieces of equipment, he can make vulcanized repairs fully as good as those turned out by any repair shop. A common type of vulcanizer, designed for the car owner's use, is shown in Fig. 1. This vulcanizer is especially convenient when making roadside repairs. The fuel is solid and is contained in a tiny pan the size of the patch. The patch is on the bottom of the pan. To make a tube repair with this vulcanizer, the pan is clamped over the damaged spot, the fuel lighted and in a few moments the repair is neatly vulcanized. This equipment does very well for the smaller tube repairs.

A small gasoline vulcanizer may be secured to make the larger repairs, although such equipment is not absolutely necessary. Almost every home affords an electric iron that can be used to cure the repair. With a little experience, a neat job of tube repairing can be turned out with the iron.

First, and the simplest of all repairs, is the puncture. Either the cold-patch method or the small tube vulcanizer may be used to make the repair. In either case the tube must be well cleaned before any repair is attempted. Sandpaper the portion of the tube around the injury until all grease and dirt are removed and a "roughed" place is provided for the patch. If some high-test gasoline can be obtained, use a little of this to clean the injury. Clean water is better than the commercial grades of gasoline, which usually contain more or less kerosene and low-grade fuel.

If the small vulcanizer is to be used to make the repair, strip the protective linen covering from the patch and clamp the pan and patch over the injury. Prick up a corner of the fuel with a nail or penknife and light. Allow the vulcanizer to remain in place for at least five minutes after the fire has died out. After that, the tube can be dusted with mica or talc, replaced in the casing and inflated. No cement is required when making a repair with this equipment.

The cold patch will require cement for holding the patch into place. Apply two or three coats of this to both the patch and the tube, and allow each coat to dry partly before the succeeding one is applied. Cut a patch from the repair stock, allowing a liberal lap all around the injury; a round or oval patch is best as there are no corners to loosen. When the final coat of cement has dried until "tacky," press the patch into place and use a small C-clamp and block, as shown in Fig. 2, for applying pressure while the cement dries. Allow the patch to dry fifteen or twenty minutes before using the tube. Many failures of cold patches are due to using the tube before the cement has dried.

The tube damage will often be in the nature of several tiny holes in a group, or a puncture which is in the center of a chafed spot. In such cases, it is better to use one large patch to cover the group of holes or the entire chafed surface. A chafed spot in a tube indicates a weakened place and it will be only a matter of time until more repairing is needed

unless the entire surface is covered. Sometimes a portion of the tube is blown out or the tube is badly torn when a tire "blows." If the hole or tear is over ½ in. long, it is best to reinforce the injury from the inside, as, if only an outside patch is used, there is apt to be a weak spot at the point of repair.

First of all, the hole should be trimmed so that the edges are smooth. Ragged edges on a hole are simply an encouragement for tears. Use sandpaper or emery cloth to clean and buff the inside and outside of the tube around the hole. Wash the injury with some high-test gasoline or some clean water. If the repair is to be vulcanized, the inside patch should be made from a material known as combination backing. This is a regular vulcanizing gum and has one side semi-cured to prevent the patch from sticking to the opposite side of the tube. Cut a patch from this large enough to lap the hole at least ½ in. all around.

Regular vulcanizing cement must be used to make the repair. Apply three liberal coats to the inside of the tire and to the raw side of the patch. When the final coat of cement is almost dry, the patch should be inserted. Moisten the inside of the tube with high-test gasoline to prevent the patch from sticking until it can be centered. Place the patch over the hole, cemented side up, and force it in with a blunt stick as indicated in Fig. 3. Lifting up on the tube while the patch is pressed in will help to get it through. Center the patch carefully before the gasoline dries and inflate the tube slightly to smooth the patch into place.

Before the outside patch is applied, the hole must be plugged with a little gum. This plug should be cut from tube-repair stock to a shape that exactly fills the hole. Now cut the outside patch, making the corners round, and the lap around the edges of the hole slightly greater than that of the inside patch. Regular tube-repair stock is used for the outside patch. Cement as for the inside patch and press firmly into place, and the repair is ready for vulcanizing.

A piece of cloth or paper should be placed between the electric iron and the patch; "holland"—the protective cloth found around new repair materials—is excellent for this purpose. Place a smooth board under the tube, and clamp the electric iron down on the repair with a large C-clamp, as in Fig. 4. Some little experience in regulating the heat is necessary to get the best results. If the iron is heated to a sizzling heat and the current turned off before the iron is clamped into place, there is usually enough heat retained in the iron to cure the repair. An undercured repair will be soft and retain the impression made when a pencil is pushed into the gum. Properly cured gum will spring back into shape after the pencil is removed. Overcured material will be hard, brittle, and lack the life of properly cured rubber.

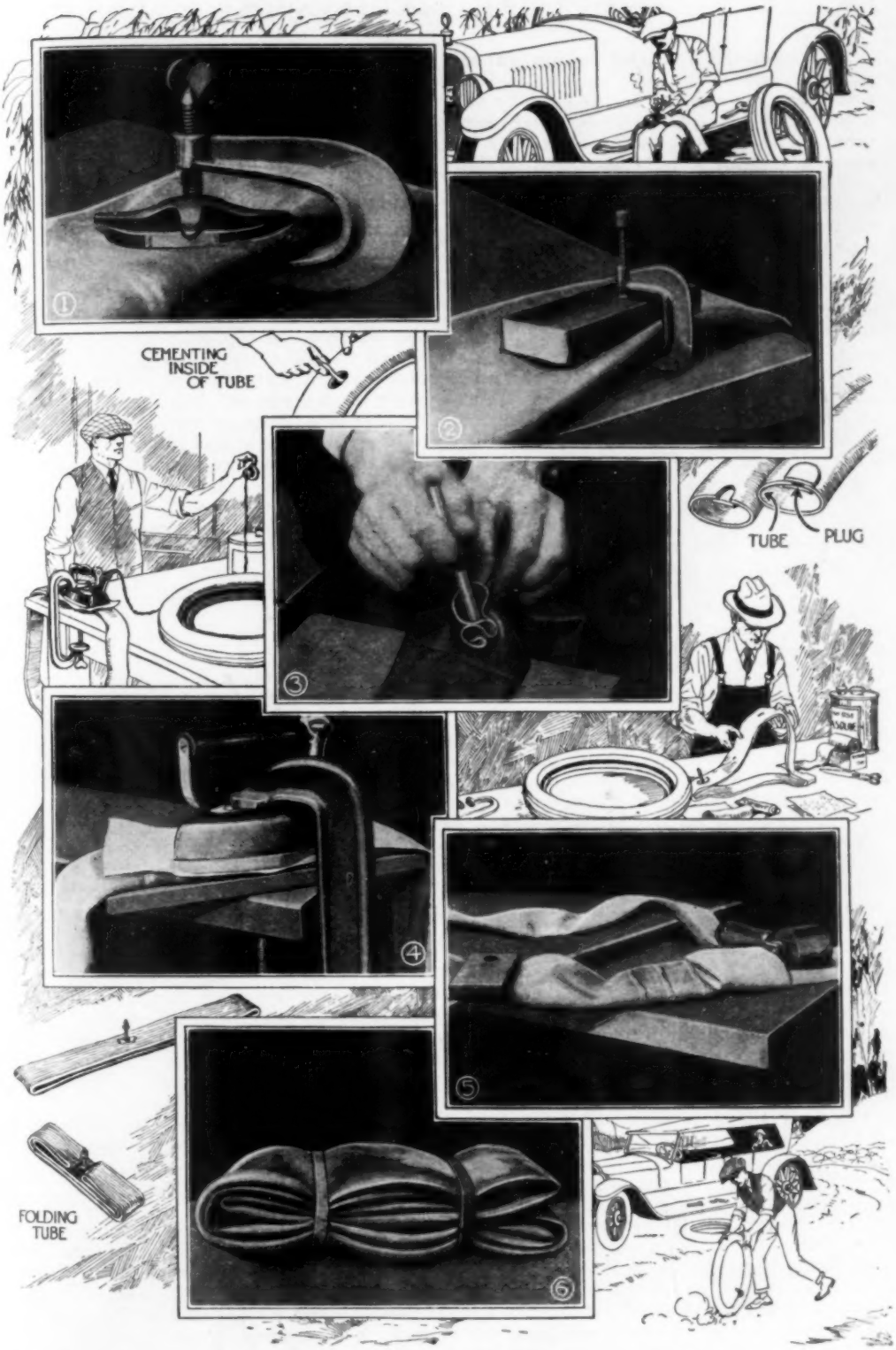
The repair just outlined can be made by using the cold-patch method, but it is doubtful if the finished job will be as satisfactory. Regular cold-patch material is used instead of the vulcanizing gums and cold-patch cement instead of the vulcanizing cement.

It is a little difficult to repair an injury very close to the valve stem. This kind of a damage, or a torn valve-stem hole, is best repaired by shifting the valve to a new position, and patching the old hole. In shifting the valve stem, one should always push the valve stem inside the tube. Any effort to pull the bottom of the stem through the hole it is to occupy may result in tearing the tube.

The valve pad for the new position may be cemented into place with cold-patch cement or vulcanized, but the latter is to be preferred as the repair is more likely to be permanent. Select the new position for the valve and cut a small hole for the stem. Buff the tube around the hole with sandpaper and wash carefully. Cut an old valve pad from a worn-out tube and buff the bottom of this thoroughly. Cement both the tube and the bottom of the pad with three liberal coats of vulcanizing cement.

Cushion stock, a yellow vulcanizing gum, is used to bind the pad to the tube. Mark out the space to be occupied by the pad and cover this portion of the tube with cushion stock, 1/32 in. thick. This is best applied in narrow strips. Continue to apply these until the entire space to be occupied by the pad is evenly covered, then press the pad into place and roll to press out any air bubbles. Fill the valve-stem hole with a chunk of inner tubing to prevent the hole from filling from the overflow of the gum during the cure. Slightly more heat may be required in this case, due to the fact that the raw gum is sandwiched between the pad and the tube. The electric iron is clamped down as before and the repair cured. After the vulcanizing is done, the valve stem may be pushed up through the hole and the valve assembly tightened into place. The hole formerly occupied by the stem is repaired in the usual manner.

be used to make the repair. In either of time until more repairing is needed



Methods of Repairing Injuries in Inner Tubes, from the Smallest Puncture to the Blowout Requiring the Splicing In of a New Section: This Work May All Be Done by the Car Owner

Bad blowouts or tears which extend part way across the tube may be so serious that they cannot be repaired by the usual methods. Sometimes what may seem to be an impossible repair may be made by cutting out the damaged section and splicing in another section of tubing the same length. This kind of repair necessitates two end splices, by far the hardest tube repair there is to make, and much care must be taken to keep the tube from being either shortened or lengthened during the splicing. The section cut out should be measured to give the dimensions for the replacement section. This section can be cut from another old tube of the same size as the damaged one. Cut the replacement section about 3 in. longer than the part cut out; this will allow for a lap of 1½ in. at either end.

By trial, it will be found that the section to be spliced in is slightly larger or smaller in diameter than the tube. Make the splice so that the smaller diameter fits inside. Clean the splice ends by buffing them with sandpaper and wash with some high-test gasoline. If the part that is to fit outside is turned back, the buffing and cementing can be done more easily. Cement both the inside and the outside section of the lap with three coats of vulcanizing cement. Cut three strips of 1/32-in. thick cushion stock and arrange them around the inside end of the splice as shown in Fig. 5. Turn back the other section over this and roll the joint to press out any air bubbles or wrinkles.

Three "hitches" will be needed to cure the joint. Clamp down the heated electric iron on the splice and allow it to cure the splice from one side. Turn the tube one-third of the way around, and repeat the operation, and finally flatten the remaining third down and cure again. After the last cure is made the tube should be plunged into water to prevent the tube from sticking together on the inside. The second end splice is made exactly the same as the first, after checking the tube for length.

These ordinary repairs will take care of all common tube injuries.

No matter which method of repair is used, the success of the repair will depend upon the cleanliness with which the work is handled and the care taken in doing the work. Grease, oil, and dirt are fatal to repairs, and the first duty of the repairman should be to see that the injury is thoroughly cleaned.

The larger tube injuries are easy to find but tiny pin-hole punctures may be difficult to locate, especially if no water is available in which to test the tube. If the repair is being made by the roadside, roll the partly inflated tube in the dust of the road, and a spurt of dust will be kicked up by the air from the puncture. The hole can sometimes be found by passing a moistened finger along the suspected part of the tube, when the air current from the hole will feel cool to the moistened finger. A particularly elusive puncture can be found by mounting the tube in a casing and inflating. Test the entire tire in a tank of water and mark the position of the leak on the casing. When the tube is removed, notice what portion of it was adjacent to the marked place on the casing.

Inner tubes become worthless if allowed to hang in the light and air for any length of time. If an extra tube is not carried in the car, it is best to fold it up and put it away in a dry and cool place. If an inner tube becomes dead and lifeless it can be restored, to some extent, by soaking in warm water.

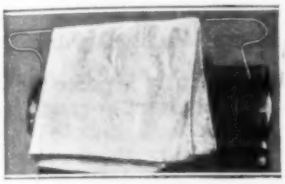
The tube which is carried in the car should be folded and packed in a bag or wrapped in burlap. Boxes should be avoided, as they are apt to rub holes in the tube. A section from a large inner tube makes a very satisfactory bag for carrying the tube. The smaller tube can be folded and slipped inside the section from the large tube. The proper method of folding the tube is shown in the lower left-hand sketch, and the folded tube in Fig. 6. Needless to say, the inner tube should not be thrown in among the tools, where holes will be punched in it. Pack it carefully and put it where there will be no danger from shifting equipment.

All the tube repairs mentioned are so simple that they can be made without the aid of an expert tire man. The materials for the vulcanized repairs can be purchased at any tire shop, and only a small quantity of any should be purchased at a time. The age of the materials has nothing to do with their quality, but dirty materials will not make good repairs and a little stock will last the ordinary man a long time. If the materials get soiled or seem to lack life, freshen them up by washing with high-test gasoline.

A gasoline vulcanizer may be purchased if desired, to make the larger repairs but there is no need of going to this expense when such excellent results can be obtained with the electric iron. If the motorist wishes to make his emergency tube repairs by vulcanizing, the small solid-fuel vulcanizer makes a very compact repair outfit.

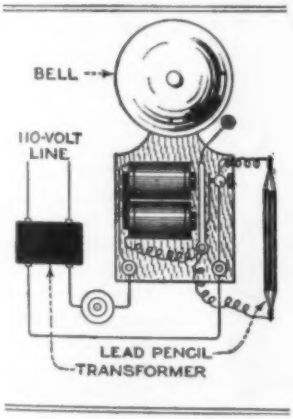
Drying Rack for Stove

The photo shows a simple drying rack, made of heavy galvanized wire, that can be attached to the stove in an instant, and removed as quickly. Each end of the wire is bent to a 4-in. loop and then bent at right angles to the front length. The ends are then bent sharply upward for a length of 1 in., to slip between the door and the frame of the warming oven. Such a rack is of considerable usefulness when a few clothes must be dried in a short time.



Preventing Bell Contacts from Sparking

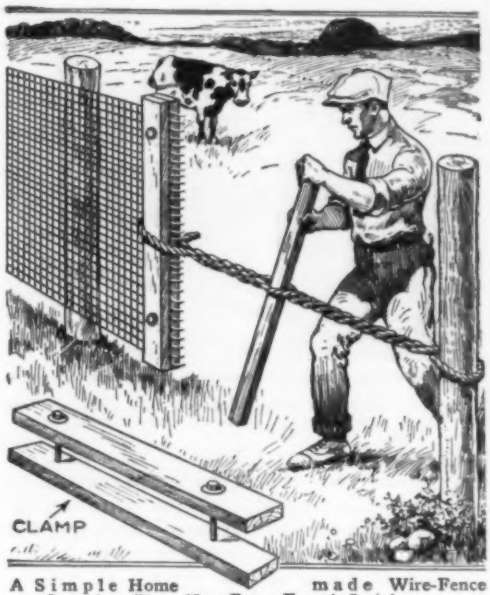
Where doorbells are operated from transformers, or directly from a d. c. house circuit through a resistance, there is usually heavy sparking at the contacts, and this rapidly burns away the points, making frequent renewals necessary. To eliminate this trouble, and make the bell operate more steadily, a resistance should be connected across the contacts as shown in the illustration. A simple and effective resistance for this purpose is an ordinary lead pencil. The wood is cut off both ends of the pencil, and the wires twisted tightly around the bared ends of the lead. The wires are connected with the vibrating member and with the fixed contact. This resistance will pass the high-voltage current formed at the break, but will not shunt out the contacts and prevent the bell from ringing.



¶ Moths will rarely touch anything wrapped in newspapers, and winter clothes thus stored will be almost sure to escape damage.

Stretching Wire Fencing

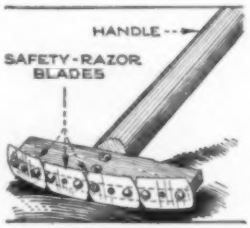
A simple and efficient wire-fence stretcher is shown in the drawing. It consists of two lengths of 2 by 6-in. wood with two or three bolts passing through them so that they can be securely clamped to the end of the fencing as shown. A heavy rope is passed around both pieces, around a fence post, and tied. A stout stick is used to twist the rope, thus pulling the fence as tight as desired. The device can be made in a short time from material that can be found on every farm. —Geo. A. Luers, Washington, D. C.



A Simple Home made Wire-Fence Stretcher That Has Been Found Satisfactory

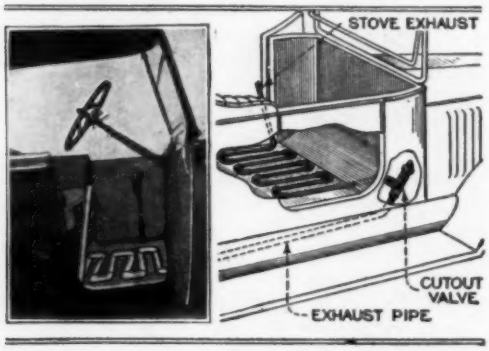
Shaving the Lawn

Shaving the lawn with a safety razor seems ridiculous, but it has been done. Passing over the lawn with a lawnmower did not exterminate the numerous dandelions, so another method was necessary. Four razor blades were screwed to the narrow edge of a short length of lath, and a handle was attached as shown in the drawing. Using this simple tool the dandelions, including the buds, fell at the slightest touch.—Francis W. Lane, Villa Park, Ill.



Exhaust-Gas Cook Stove for the Tourist

When equipped with a stove of the kind shown, the tourist does not have to worry about fuel for his stove, as his gasoline is also his fuel supply. The

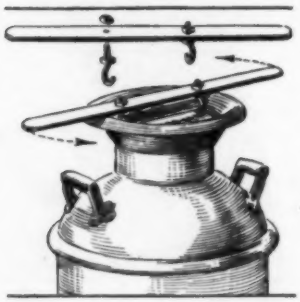


Camp Cooking Is Simplified by the Exhaust-Gas Cook Stove on the Floor of the Automobile

whole apparatus consists of pipe and fittings arranged so that it can be connected to the exhaust pipe of an automobile. The stove is made of several short lengths of pipe connected together by return elbows to form a hot plate. A cutout valve is inserted in the exhaust pipe at the point shown so that the stove can readily be attached and detached. It is, of course, necessary to provide a thick sheet of asbestos between the hot plate and the floorboards to prevent burning the latter. When the plate is not in use it is removed.—Curtis Clark, Waldo, Ark.

Tool Removes Milk-Can Covers

When the lid of a filled milk can is pressed down to prevent spilling the contents in transportation, a partial vacuum is created, which makes it extremely difficult to remove the cover again. To overcome this difficulty a Wisconsin farmer made the simple tool shown in the illustration. It consists of an iron bar with two holes drilled as shown to receive bolts, which have their heads cut off and the shanks bent to form hooks. In use the tool is grasped at the two



ends and lowered so that the hooks engage with the handle of the cover. A quick twist and pull serves to loosen the most stubborn lids. This eliminates the use of mallets or hammers for removing the covers, a practice that damages thousands of covers every year.

Tightening Loose Watch Crystal

Watch crystals frequently become loose and cause a great deal of annoyance by constantly falling out. A simple and effective method of making them remain in place is to put a minute drop of glue at six or eight points in the groove. This can best be done with a toothpick or match stick. When the crystal is snapped back into place it will remain there indefinitely. Any glue that squeezes out on the glass can be removed very easily after it has dried.

Saving the Ties

The necktie kink shown in the illustration prevents neckties from stretching out of shape and from raveling, and eliminates the necessity of tying them every time they are worn. A permanent knot is tied on a flexible armband as shown in Figs. 2, 3, and 4, the band being cut in two at the point indicated, and the ends fitted with a hook and eye. The method of arranging the band under the collar is shown in Fig. 5.—Robert C. Knox, San Luis, Calif.

Repairing Narrow Curtain Lights

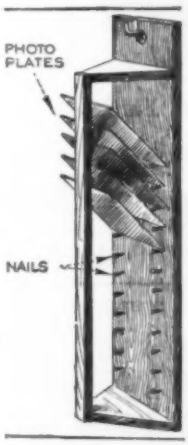
Broken celluloid curtain lights on a car can be readily and inexpensively replaced with ordinary kodak film, developed without being exposed. Cut the strip of film to the proper length and fasten it in place. As this film is thinner and more flexible than the celluloid used in curtains, it will not break so easily.

Storing Robe in Roadster

How to prevent the robe in my roadster from becoming soiled, was a problem that troubled me for a long time; it could not be kept clean on the rear deck, or on the floor of the compartment behind the seat, and it was impossible to keep it on the seat. I found, however, the use of a towel rail, screwed inside the compartment behind the seat, to be very satisfactory. It was large enough to accommodate the robe and also a sweater or coat, and prevented these from becoming soiled.—M. C. Johnstone, Madison, Wis.

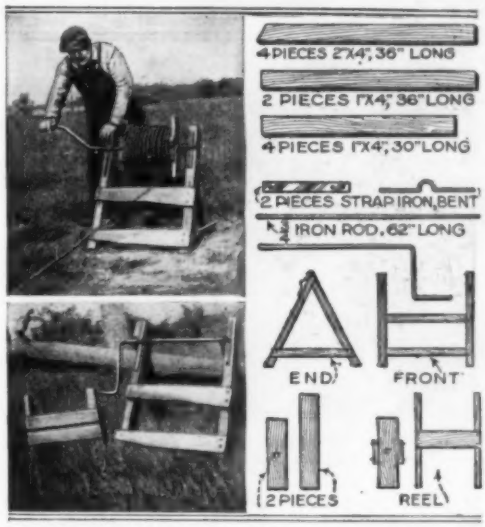
Simple Negative Rack

The illustration shows a simple negative rack that can be made by anyone in a few minutes, from 4 pieces of wood and a number of nails. The back or base is about 4 in. wide and about 1 or 2 ft. long, and a hole is drilled at one end so that it can be hung on the wall. Two triangular-shaped blocks, about 4 in. high, are nailed on the baseboard and a length of 1-in. wood is nailed to these, as indicated. Small brass nails are driven into the base from the back, and are spaced about ¾ in. apart; the plates are set on the nails and rest against the front strip at an angle, as shown.—John H. Curtis, Philadelphia, Pa.



A Barbed-Wire Winder

The barbed-wire winder shown in the photograph can readily be made from material found on every farm, and it winds the wire on a spool just as neatly as is done in the factory. It consists of a frame made from pieces of wood of the dimensions shown in the illustration. Two V-shaped end supports are made of 2 by 4-in. lumber, the ends being spiked and bolted together. The supports are inverted and crosspieces are nailed on, the crosspieces being about 30 in. long. A strap-iron bearing is screwed on each support near the top as indicated in the end view, or if preferred, a ¾-in. hole can be drilled through the ends of the V supports to serve as bearings instead of the strap-iron pieces. A ¾-in. pipe or rod is bent to the shape of a crank and a ¼-in. hole is drilled through the crank, about 6 in. from the straight end, so that the spool can be securely attached. The

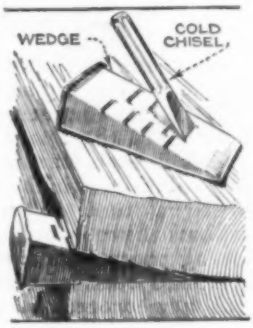


A Simple Homemade Barbed-Wire Winder Made from Material Available on Every Farm

spool consists of two pieces of 1 by 5 by 16-in. wood with a ¾-in. hole drilled through the center, and two pieces of 1 by 5 by 20-in. wood, nailed across the first. The winding crank is pushed through the bearings of the frame and holes in the spool and a 6-in. spike or round piece of iron, held by ordinary fence staples, driven through one board of the spool, keeps the spool securely on the crank.

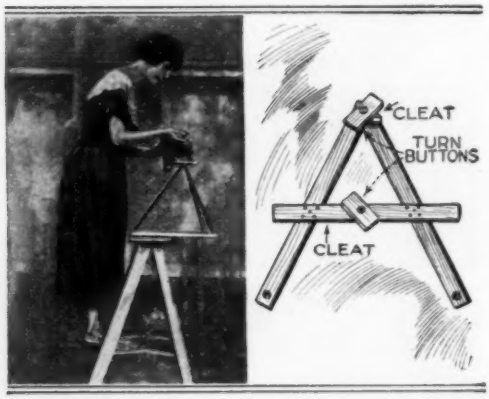
Keeping Wedges from Rebounding

Log-splitting wedges become smooth and polished after being used awhile, and this condition allows them to rebound very easily when driven in. The trouble can be eliminated by cutting a number of nicks in the sides of the wedge with a cold chisel, the nicks being driven in toward the point of the wedge. The edges of the nicks are slightly burred and this prevents the wedge from rebounding.



Stepladder Extension for Camera Tripod

In order to take pictures of objects too high for the reach of the ordinary tripod, an amateur photographer devised the combination stand shown in the photo.



A Convenient Extension on the Top of a S epladder Provi..es a Stable Base for the Camera Tripod

It consists of a wooden frame that can be attached to the top step of a stepladder so that the camera tripod can be conveniently mounted on it, enabling the photographer to look into the finder and locate his subject almost as easily as on the ground.

The frame is made by cutting two hardwood legs as shown in the detail, and nailing them together at one end, at an angle of 60°. Nail a small cleat over this joint, and parallel to it, at a distance equal to the width of the upper step of the stepladder, nail another cleat. Screw a heavy turn button to the center of each cleat so that the frame can be clamped securely to the stepladder. Bore small holes in the ends of the legs and at the joint to receive the points of the tripod legs, to prevent the tripod from slipping.

Two-Tone Photographs

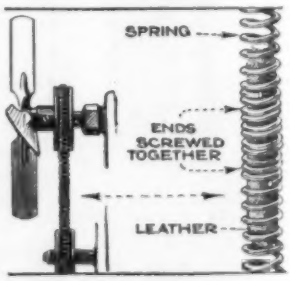
Most amateur photographers are familiar with the sepia-toning process; the print is first immersed in the bleaching bath until the image is almost invisible and it is then transferred to the sulphiding solution, which restores the picture in sepia tone. However, few photographers have much use for the sepia-toning process, as it can be used only for a limited class of subjects.

A new process of toning photographs in two colors, sepia and black, produces an artistic effect and greatly increases the field of sepia-toning. The portions of the photo that are to be toned sepia are painted with a double-strength bleaching solution, applied with a small camel's-hair water-color brush. The bleaching is accomplished much more easily by soaking the print in water and blotting it so as to leave it moist before applying the bleaching solution. Care must, of course, be taken to avoid getting any of the bleaching solution on the portion of the print that is to remain black. After bleaching, the print is immersed in the sulphiding solution. The portions of the print that have been bleached will be sepia and the rest of the photo remains black, giving a pleasing combination.

Objectionable backgrounds should be sepia-toned to make them less conspicuous, allowing the subject to remain black, but in cases where the subject is of a brownish color, it should be toned sepia to make it appear more natural, as black and white photos cannot do justice to a brownish subject.

Coupling for Spring Fan Belt

The illustration shows how a screen-door spring was used in an emergency as a fan belt on an automobile. The spring was stretched until the pitch of the coils was about ⅛ in., in order to give it the necessary stiffness. The two ends were coupled by means of a 1½-in. length of round leather, with the ends slightly tapered to make an easy entry into the ends of the spring. This piece was screwed halfway into each end of the spring and the spring was twisted until the ends screwed into each other far enough to tighten the spring on the pulleys. The spring belt thus made was only intended as an emergency repair but was found to give better service than the regular V-belt.



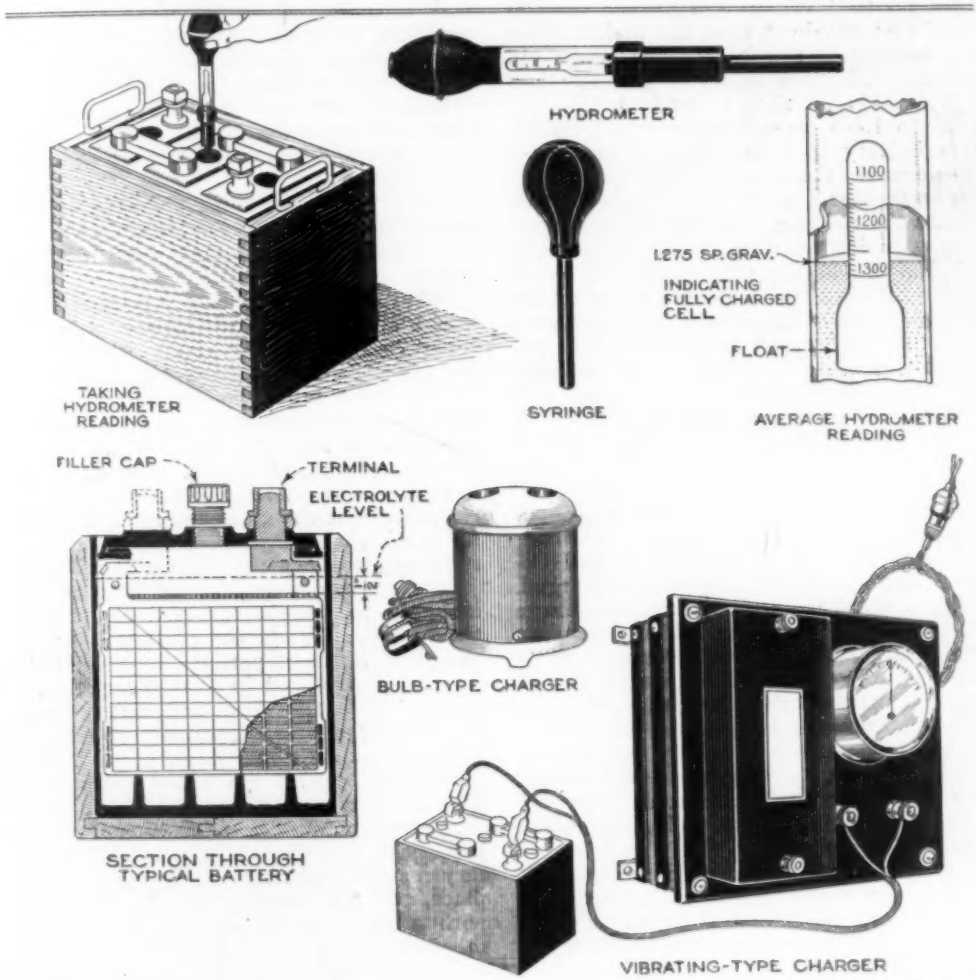
¶ When an ink bottle was accidentally upset on a carpet, a quantity of ordinary table salt was instantly applied to the spot; the ink was quickly absorbed by the salt, and when the latter was removed by means of the vacuum cleaner, the spot was scarcely visible.

Care of Radio Storage Batteries

By F. L. BRITTIN

ONE of the most necessary pieces of radio equipment—and the one that usually receives the least care—is the storage battery. The life of a storage battery can be prolonged to a remarkable extent by a little intelligent care, but most amateur operators, aside from the dyed-in-the-wool "hams," abuse their batteries unmercifully, and then wonder why such an expensive piece of equipment does not stand up long.

Every owner of a storage battery should own a hydrometer, and use it every ten or fifteen days to determine the specific gravity of the electrolyte. This instrument consists of a glass tube or barrel, with a rubber bulb at the top, a nozzle at the bottom, and a weighted float inside, marked with graduations on the neck; the graduations usually run from 1.300 to 1.100, although the decimal point is often omitted on the scale figures. The method of using the instrument is as follows: Unscrew one of the filler caps on the battery and insert the nozzle of the hydrometer into the electrolyte. Compress and release the bulb at the top two or three times, and then withdraw the nozzle. The barrel of the hydrometer should now be about half full of electrolyte, and the float will ride in the liquid at a depth depending upon



Various Instruments and Methods Used in Caring for the Radio Storage Battery: A Little Intelligent Care Will Prolong the Life of Any Battery, and the Time Is Well Spent

the specific gravity. Hold the barrel vertically so that the float will not rest against either side of the tube, and, to prevent the electrolyte from running out, compress or bend the rubber nozzle tube. When the float is at rest, observe the point on the scale reached by the liquid level. It will be found that the gravity of a fully charged cell will vary, with the make of the battery, all the way from 1.275 up to 1.300, so the proper reading should be obtained from the maker when the battery is purchased. Also, an old battery will show a lower gravity than a new one, so that a reading of from 1.250 to 1.275 may indicate a full charge in a battery that has been in use for a considerable time.

The temperature of the electrolyte also affects the reading. The normal temperature at which readings should be taken is 70° F., and if the temperature is much below or above this point, a correction should be made. However, batteries used in the home are not much subject to extreme changes in temperature, so this point can be neglected.

Taking an average reading of 1.275 as indicating a fully charged battery, then a reading of 1.245 would indicate that the battery was three-fourths charged; 1.210 that it was half charged; 1.180 one-fourth charged; 1.150 fully charged. The reading should never be allowed to fall below 1.180 before the battery is recharged.

After the reading is taken, discharge the electrolyte into the cell, and test the other cells, one at a time. Never assume that because one cell indicates a full charge that the others are all right—test them all. Care must be taken not to spill the electrolyte on the battery top, and, if this is accidentally done, the liquid should be washed away with ammonia water or a solution of washing soda, afterward wiping the top dry.

Always return the liquid *to the cell from which it was taken*, as taking electrolyte from one cell and returning it to another will unbalance the electrolyte, and make future readings unreliable.

If the level of the liquid is below the tops of the plates, so that enough cannot be drawn to float the hydrometer, enough distilled water should be added to bring the liquid to the correct height. Before taking a reading under these conditions, however, the battery should have several hours' charge to mix the liquid thoroughly. Always wash out the hydrometer with distilled water after using, as the electrolyte will rot the rubber if allowed to remain in it.

The electrolyte must always be kept ½ in. above the tops of the plates in the battery, and it will be necessary to add pure distilled water to each cell about once every two weeks to accomplish this. A special syringe is best for this purpose, and may be obtained at any battery station, but the hydrometer syringe may also be used. If one cell regularly requires more water than the others, a leak is indicated, and the cell should be replaced by a new one by a competent battery repairman. If the specific gravity in one cell is 50 to 75 points below the others, it indicates a short circuit, and this also demands the repairman's attention, as it will injure the battery seriously if neglected.

Under no circumstances should acid be added to the electrolyte, except by the repairman; use nothing but distilled water.

Several types of battery chargers are now on the market, and two of these are illustrated in the drawing. The vibrating type, while a little noisy, gives good service; the bulb type is comparatively quiet, and the author has used a charger of this kind for several years with good results. A double-pole, double-throw switch, placed under the operating table, is used to cut the charger in and out, and an overnight charge is all that is usually necessary to keep the battery "up."

Never overcharge the battery, as this is likely to buckle the plates and ruin the battery. When the battery is not in use for a long period, it should be drained and placed in dry storage at the battery station, or kept full, and a freshening charge given it once a month, to keep it in condition. Also, never keep a battery in any place where the temperature is likely to fall below zero.

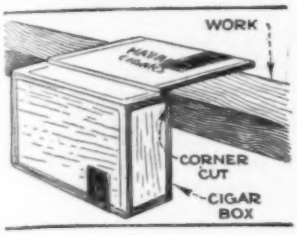
Always remove the filler caps from the battery while charging; when the battery reaches full charge, gassing will take place, and the battery top will be covered with a fine deposit of electrolyte. Remove this with a cloth dipped in ammonia water, wipe dry, and replace the caps. It is a good idea to keep the terminals and connectors liberally covered with vaseline, as this prevents corrosion.

With proper care, a storage battery has been known to last five years, in very good condition, so that the time and trouble spent in caring for the battery will prove a paying investment.

¶Thin sheets of paper may be pasted together without wrinkling, by using air-drying rubber cement.

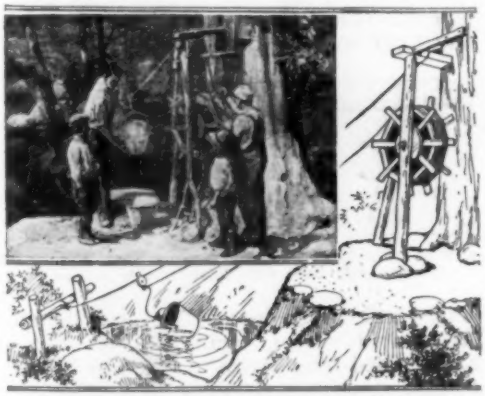
Cigar Box Used as Square

While building a gate I mislaid my square, which made it necessary to make use of some substitute. Finding a cigar box I tried to use it in the manner illustrated and found that it did the work quite as well as a square, and was also just as handy. To test its accuracy, I used it to mark a continuous line around a piece of 2 by 4-in. wood, and found that the last line was perfectly in line with the first. The corner was cut as indicated so that the first line marked could plainly be seen when drawing the second.—Ben Frantzreb, Indianapolis, Ind.



Conveyor for Lifting Water up Incline

The drawing and photograph show a convenient method of conveying water up a steep incline, in order to eliminate hard climbing, which was otherwise necessary to obtain water from a point below the camp. The conveyor consists of a pail suspended a few feet below an inverted pulley, which runs on a wire suspended rigidly between a tree at the camp and a post driven into the ground near the water supply as shown. A long rope is connected to the pulley and is wound on a large wooden drum, which is revolved to raise or lower the pail. When the pail is lowered it strikes the water and tips over, filling up immediately.



A Handy Conveyor for Lifting Water up Steep Inclines, That Saves Hard Climbing

Concealed Counterweight for Cellar Door

The old-style trap doors covering the outside cellar stairs are rather unhandy to open, and for this reason counterweights, arranged as indicated in the drawing, have been found to be of considerable assistance. A hollow post made of ¾-in. lumber, and set securely in the ground, is located on each side of the door. A pulley is fastened in one side for a chain to run over, one end of the chain being attached to the door, and the other end to a counterweight such as an old sash weight.

Counterweights Concealed in Ornamental Posts Aid in Opening Heavy Cellar Doors

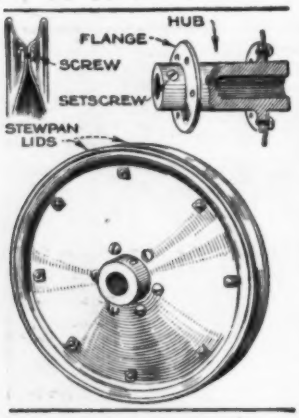
The appearance of the posts is greatly improved by mounting wooden flower boxes on top of them. The post and flower box are painted the same color as the house.—M. E. Duggan, Kenosha, Wisconsin.

Draft Shield for Carburetor

On many automobiles the carburetor is situated rather low on the side of the motor, right in the path of the air draft, which, during cold weather, cools the carburetor and prevents it from working properly. This trouble can be eliminated by providing a sheet-metal shield, large enough to close the space between the engine and the hood, and extending at least to the top of the motor. It is fastened under a manifold clamp, and its edges are rolled or bent over to prevent cutting the hands. Galvanized iron or brass is the best material to use for the shield.

Pulley Made of Pan Lids

A round-belt or V-pulley is often used in model and experimental work. As pulleys of the right diameters cannot always be purchased, the builder is often forced to make his own. A neat and strong pulley of large diameter can be made out of two stewpan lids, bolted together as shown in the drawing. The knobs are removed and the rivet hole is enlarged to slip over a brass or steel hub, which can be keyed or screwed to the shaft. The center hole must, of course, be in the exact center of the lids. Six small screws are used to hold each lid to a hub flange, the flange being drilled and tapped to receive the screws. Stovebolts, as many as are necessary, are used to clamp the two lids firmly along the edge. Pulleys of this type are light and strong, besides being neat in appearance.

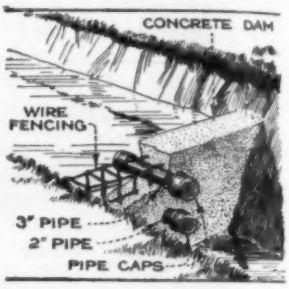


Simple Hanger for Portable Lamp

A convenient device for holding an extension cord at any point above the workbench or lathe is shown in the illustration. It consists of a length of heavy wire, stretched tightly over the bench, and a wire hook, fitted with a short chain and a spring clothespin as shown. The socket end of the extension cord is held by the clothespin, allowing the lamp to be hung at any desired height, and the hanger can be slid along the wire to the most convenient position for the worker. The wire on which the hanger slides is suspended between two walls and is kept taut by means of a turnbuckle at one end. The clothespin is fitted with a wire hook, run through the center of the spring.

Spillways for Miniature Dams

On small concrete dams short lengths of pipe, with a cap on each end, make excellent spillways. They are, of course, inserted through the form, and the concrete poured over them and the wire fencing used as reinforcement. The pipes should be of different sizes, to allow variation in the rate of discharge, and they should be located one above the other as indicated, to make possible complete control of the height of the water behind the dam.



How to Make an Arrow Pistol

The arrow pistol shown in the photograph is a simple and entertaining device that can easily be made by anyone. A 14-in. length of pipe, or tubing, cut from the head of an old brass bedstead, forms the barrel. This is attached, with strips of tin, to a stock or grip, cut from a piece of wood, the top edge of which is grooved for the barrel. A strip of rubber, ½ in. wide and 10 in. long, is cut from a discarded inner tube, and this is fastened to each side of the grip, by placing a square piece of tin over the ends, doubling the rubber twice, and fastening it with wood screws. The arrow can be made from any light wood, either tipped with feathers or not, as desired. The head should be pointed with a small nail, set into a hole drilled lengthwise in the wood. The mature stems of cat-tails, when cut to the proper length and tipped with shingle nails, form excellent arrows. Guns of the kind described have been found to shoot nearly 1,000 ft., with greater accuracy than a bow and arrow in the hands of a novice.

A Novel Pistol for Shooting Arrows That Will Shoot Nearly 1,000 Feet with Considerable Accuracy

Making a Gear Tight

Considerable trouble was experienced with a large crank gear on a deep-well pump, as it came loose repeatedly, although it was retained in position by a setscrew clamping down a heavy key. To overcome the difficulty I mixed finely sifted cast-iron filings and common table salt with water into a creamlike mixture, poured it into the setscrew hole, then forced the setscrew down to the key. After pouring in so much of the mixture that it began to come out of every crevice, I put the setscrew down to stay and allowed the pump to stand idle for a few days. After being repaired in this way it has been in use continuously for over a year, and the gear is still tight.—E. B. Johnston, Canton, Ohio.

Baby Crib Made from Barrel

The latest contribution to a baby's ward in a hospital in Oakland, Calif., is a "barrel crib," which was devised to meet the shortage of baby cribs. The barrel was sawed out as shown and was mounted on a simple wooden frame made of 1 by 4-in. material. The barrel was padded on the inside with a heavy comforter, which was tacked on. The outside was rubbed down smooth with sandpaper, and given a liberal coat of white enamel, and a neat brass drawer handle was screwed to each end, so that the crib could be carried around conveniently. A number of these cribs have been made, and have given every satisfaction.—Miss Seline Hess, Oakland, Calif.

Straightening Gut Leaders

A gut fly or bait leader that has been coiled for any length of time is very hard to handle, as it kinks and jams easily, and is liable to crack when it is straightened out. To overcome this, take a piece of rubber about 3 in. square, from an old inner tube, and rub it briskly over the leader a few times; this will straighten it perfectly.—M. W. Meier, Seattle, Wash.

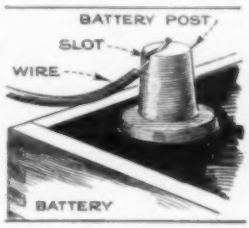
Portable Handrail for Porch Steps

Accidents on slippery porch steps, due to the formation of ice, can be avoided by the use of the portable steps and rails shown in the photo. The device is made of wood and fits over the steps as indicated. The tread is cut from 1-in. boards, about 4 ft. long, so that two persons can pass side by side. The sidepieces are cut from 2-in. material, notched to fit the steps. The vertical pieces, supporting the rail, are made of 2 by 2-in. stuff, and are braced by triangular blocks cut from the sidepiece material. The particular advantage of this device is that it can be put away when the winter is over.

A Portable Step and Rail for the Porch Prevents Accidents Due to Slippery Steps

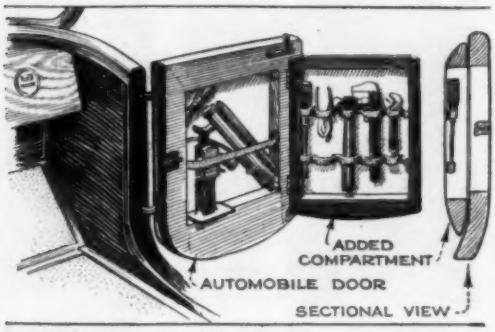
Making Tight Battery Connections

Storage batteries used on automobiles often have plain tapering terminals and this makes it unhandy to use them for radio purposes, as it is so difficult to attach wires to the terminals securely, in the absence of heavy test clamps. A tight connection can, however, be made by cutting a small slot in the top of the terminal with a hacksaw as shown in the illustration, inserting the bared end of the wire in the slot, and tamping the slot closed with a blunt-nosed tool. The small slot can hardly be noticed and will do no harm to the battery. This method of connecting is used in a battery station in preference to using clips, as these are soon ruined with battery acid and then make a poor contact, which has repeatedly caused the burning out of the rectifier bulb.



Tools Carried in Auto Door

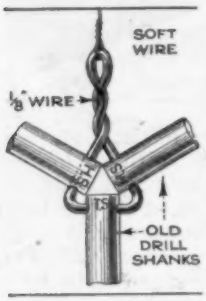
Vacating the rear seat of an automobile so that tools can be obtained from under it, is very inconvenient to the passengers, especially during cold or rainy weather. A solution of this problem is to keep the tool kit elsewhere in the car, as for instance on the front door. The inside covering of the door is first removed and a frame, 2½ in. deep, covered with galvanized iron, is hinged to the door as indicated. The combined width of the door and of the additional compartment furnishes sufficient space for the jack, tire pump, and other tools. The tools are held in place by means of leather straps, arranged as shown, and a small catch is used to keep the compartment closed.



A Handy Automobile Tool Kit Incorporated with One of the Front Doors to Save Space

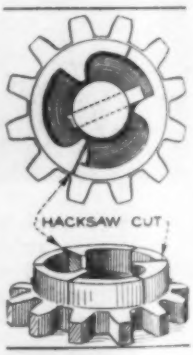
Testing Steel on Emery Wheels

Arguments often arise in the shops as to what particular type a certain piece of steel belongs. It is generally known that each kind produces a spark peculiarly its own, when touched on an emery wheel; but what these sparks are like, and to which kind of steel each belongs, is not so easily remembered by everyone. The three most commonly used steels—machine, tool, and high-speed—can usually be recognized if the material is new, but if it is old, or has been used previously on other work, it is hard to judge just what it is without testing in some way. A good practice, to avoid mistakes, is to keep samples of each at hand. The illustration shows a simple method of doing this, which possesses the all-important feature of keeping the pieces together. Two old drill shanks, one of high speed, the other of tool steel, and a scrap piece of machine steel, have a ⅛-in. hole drilled through one end, and are stamped HS, TS, and MS respectively. The pieces are forced onto a ⅛-in. wire, which is then bent to a triangular shape to keep the pieces well apart, and twisted together, leaving a loop at the top. A length of soft wire is attached to this loop, the other end of the wire carrying a weight, and the whole thing fastened under the bench where the grinder stands, by two staples. In this manner it is kept out of the way when not in use. When it is desired to test a piece of steel the test pieces are pulled forward and touched on the wheel, while the piece to be tested is touched on the other side. In this way it is obvious to the most unskilled, by comparing the sparks, what kind of steel is being tested.



A Simple Lawn-Mower Repair

One of the signs of old age in a lawn mower is the failure of the knives to rotate when taking a heavy cut. Perhaps more lawn mowers are consigned to the scrap heap for this reason than for any other; yet the difficulty can be remedied very easily by a few minutes' work. Remove the wheels of the mower by unscrewing the center bolts, and lift off the spur gears that drive the knives. A 3-pawl ratchet, cast within the hub of the gear, acts on a sliding key running through the end of the knife shaft. As long as the faces of these pawls are nearly radial, they fit flat against the key when driving the knives; but when worn, as indicated in the upper detail of the drawing, they wedge the key down so that it ratchets in both directions, thus failing to rotate the knives.



The remedy is to dress the faces of the pawls. This can be done best by cutting straight through the front edges of the pawls, hub and all, with a hacksaw as shown, then chipping off the worn portion. The resulting cuts in the hub do not weaken it to any extent, as actual repairs made in this way have worked perfectly without any consequent breakage.

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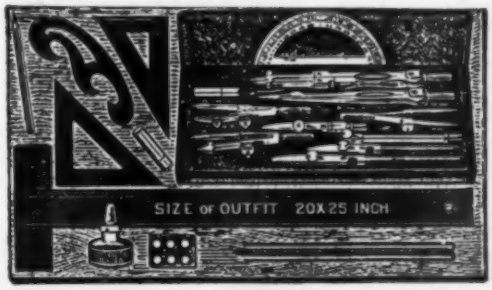

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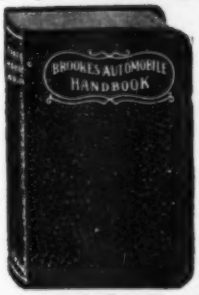

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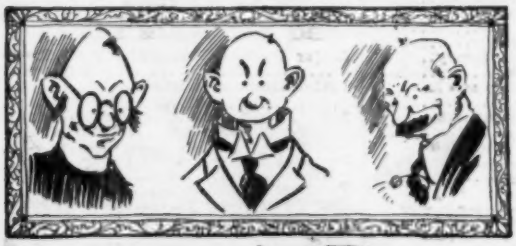

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Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, who having been duly sworn, according to law, deposes, and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill. Editor, H. H. Windsor, 200 East Ontario St., Chicago, Ill. Managing Editor, Charles H. Gabriel, Jr., 200 East Ontario St., Chicago, Ill. Business Manager, H. H. Windsor, 200 East Ontario St., Chicago, Ill. Second. That the owners are (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): H. H. Windsor, 200 East Ontario St., Chicago, Ill.; L. B. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; First Trust and Savings Bank, Trustee for H. H. Windsor, Jr., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are (if there are none so state): None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him. H. H. WINDSOR, Editor.
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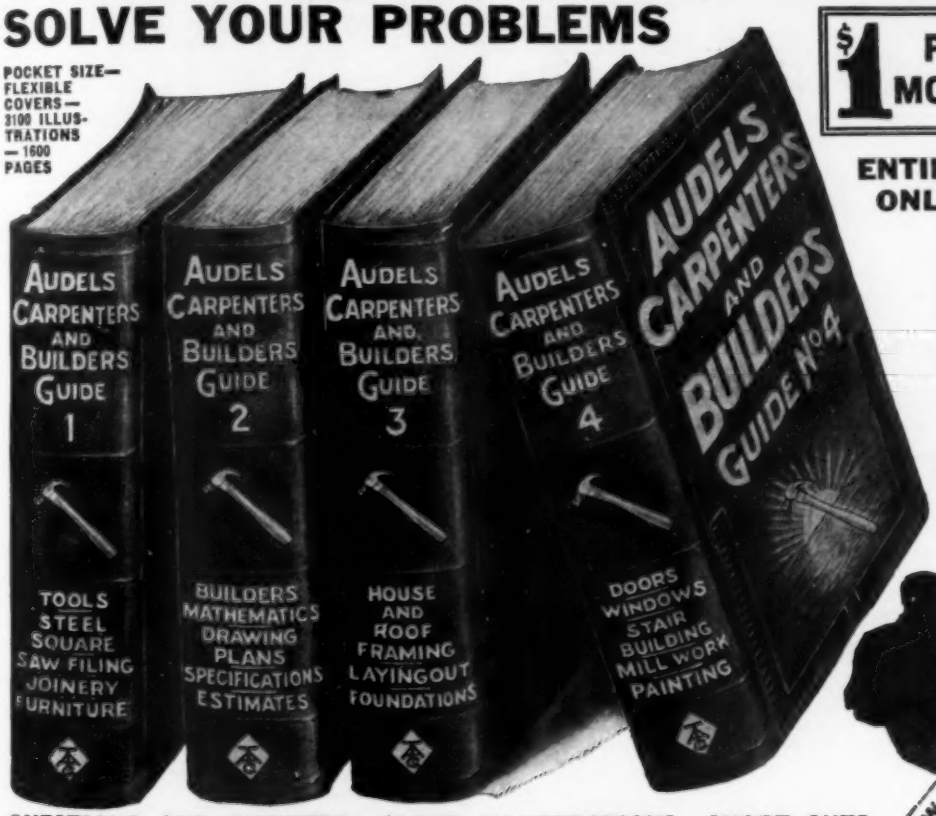

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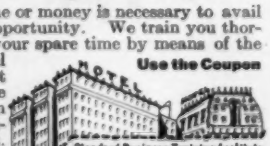

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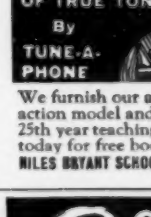

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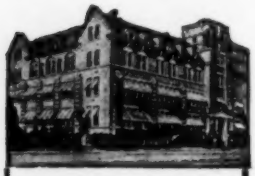

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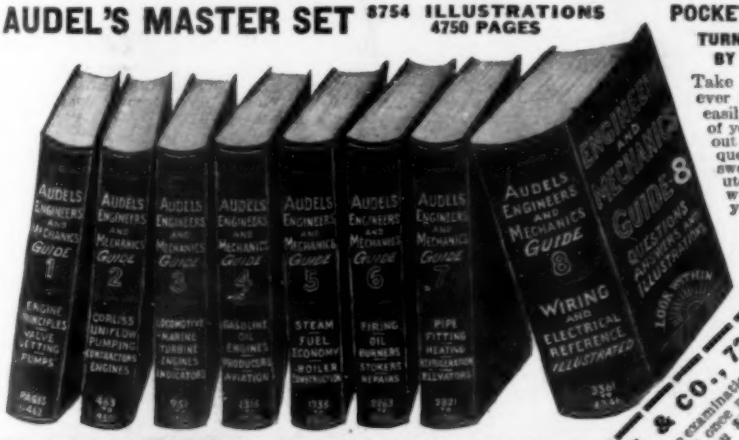

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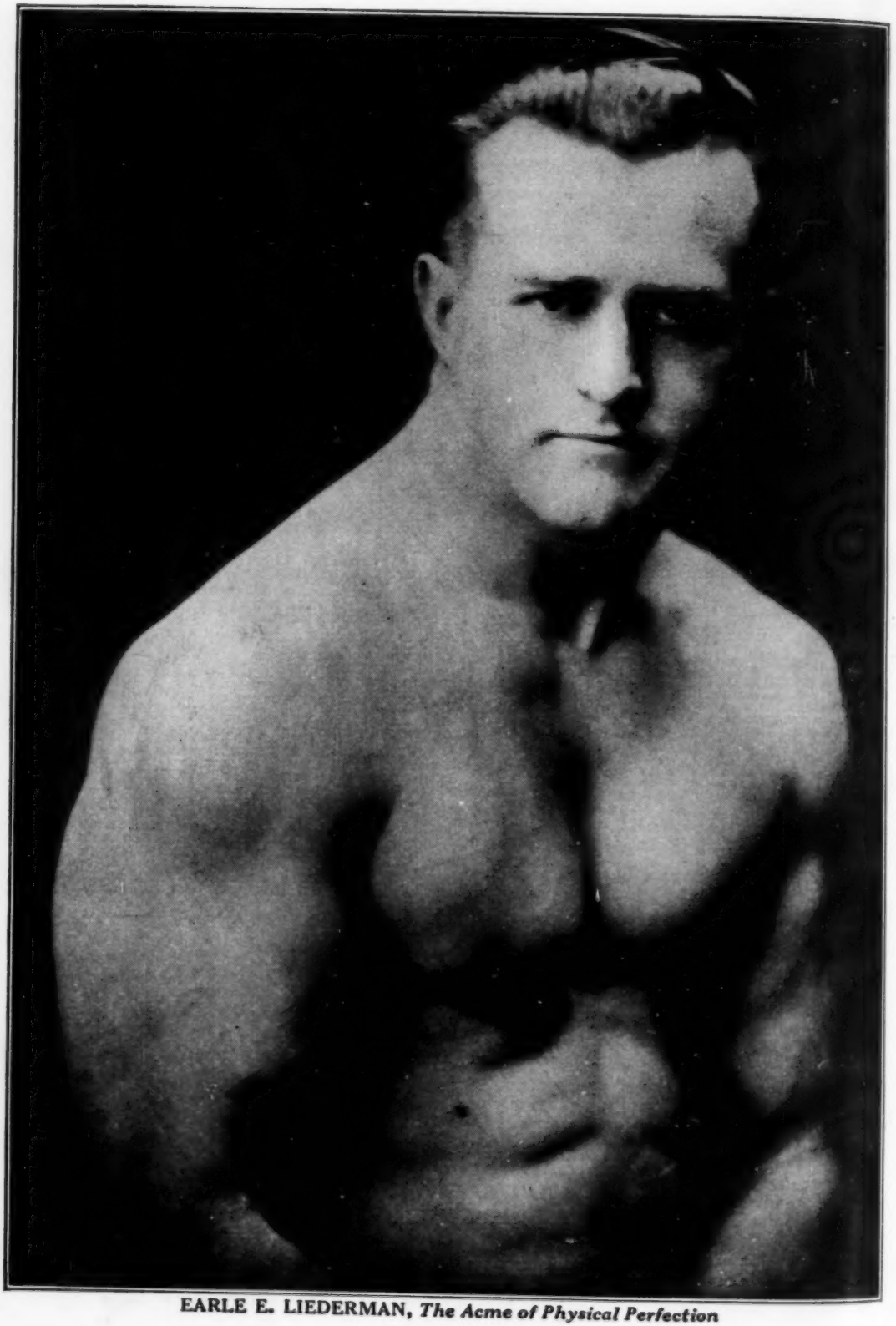

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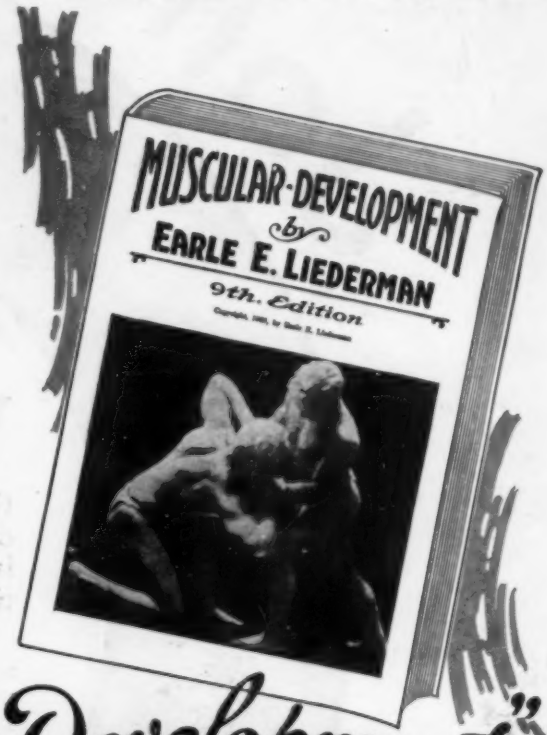
Strength Is Yours

Wake up, fellows, and look the facts in the face. It's up to you right now. What do you plan to be—a live one or a dead one? Health and strength are yours if you'll work for them, so why choose a life of suffering and failure?

Exercise will do it. By that I mean the right kind of exercise. Yes, your body needs it just as much as it does food. If you don't get it you soon develop into a flat-chested, narrow-shouldered weakling with a brain that needs all kinds of stimulants and foolish treatments to make it act. I know what I am talking about. I haven't devoted all these years for nothing. Come to me and give me the facts and I'll transform that body of yours so you won't know it. I will broaden your shoulders, fill out your chest, and give you the arms and legs of a real man. Meanwhile, I work on the muscles in and around your vital organs, making your heart pump rich, pure blood and putting real pep in your old backbone. This is no idle talk. I don't promise these things—I guarantee them. If you doubt me, come on and make me prove it. That's what I like.



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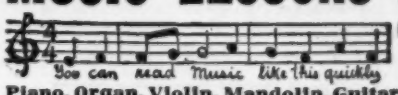

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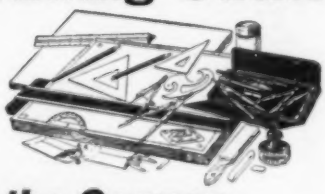

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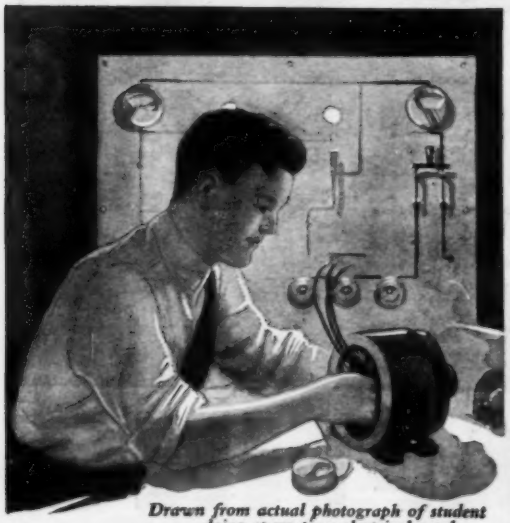

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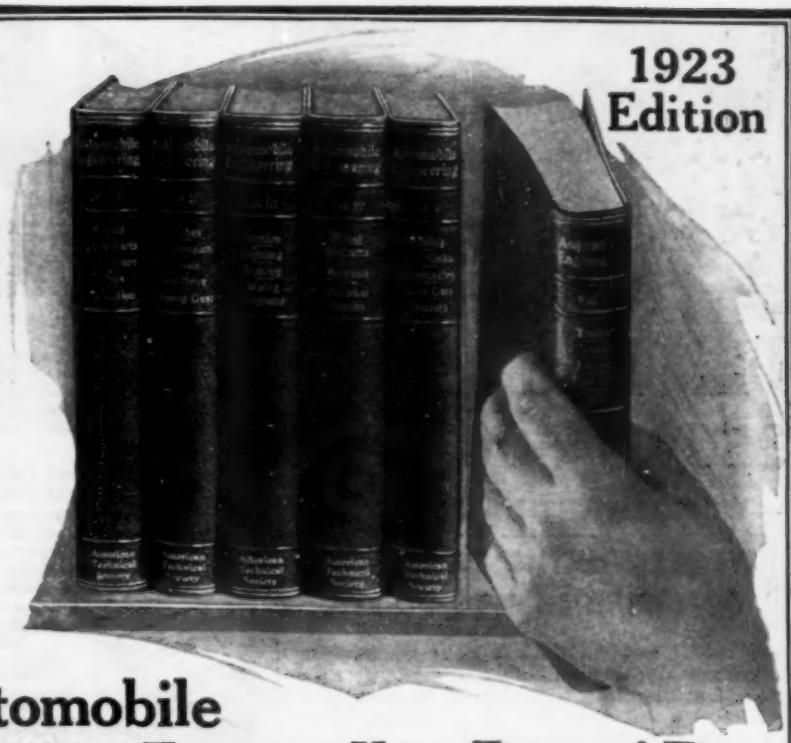

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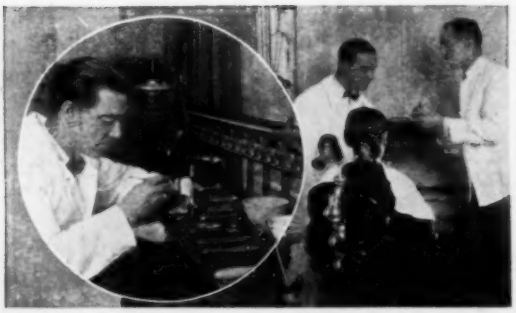

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To one the sentence is, "One week in bed!"; to another, "Three months in the hospital!"; to another "Two years on toast and hot milk!"; to another, "Ten years of torture!"; to another "A crippled leg for life!" Now and then as some poor wretch comes up for judgment, the Magistrate draws on his black cap and solemnly pronounces the sentence, "DEATH!"

But occasionally a different sort of offender steps up to the rail—a lithe, ruddy, clear-eyed chap whose smooth skin is plumply filled with sound, hard flesh which ripples under it in muscular cords and knots. He has perhaps committed some error in diet or hygiene, but it is evident that the Judge is disposed to be lenient with him. He merely shakes his finger at him, trying to hide a smile as he does so, and says "You've been a pretty healthy citizen in the past, so I'll let you off easy this time. Discharged!" and his eye follows the powerful figure with approval as he strides out of the courtroom.

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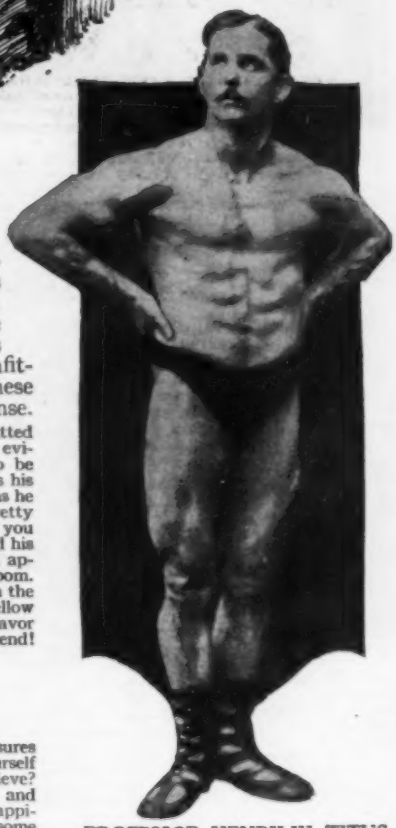

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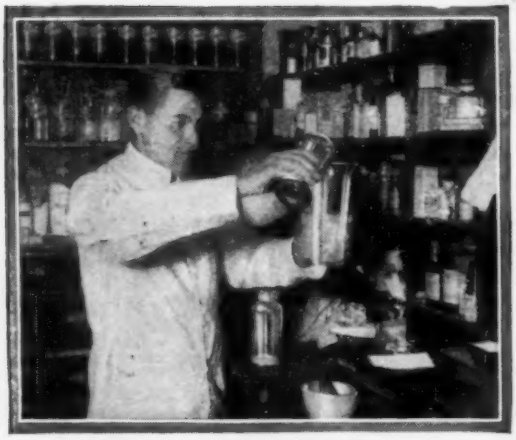

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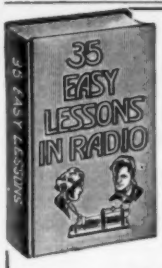

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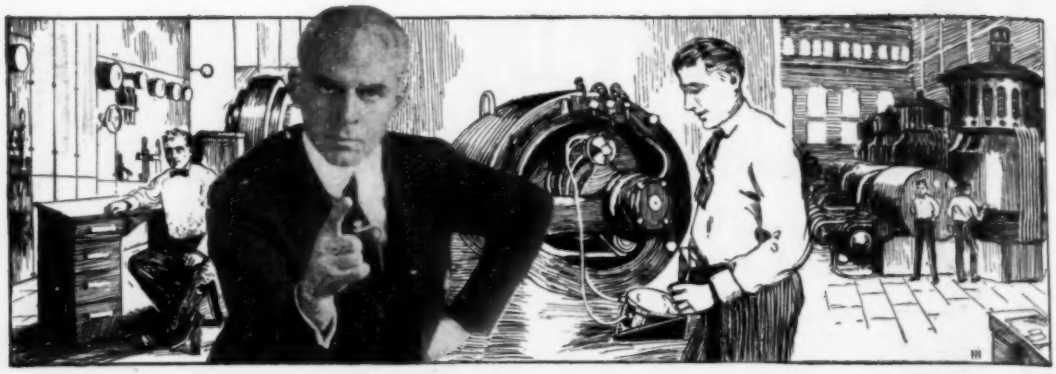

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$5 PROFIT selling $7.50 necessity. Write for sample. Merchants Ass'n, Minneapolis, Minn.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

AGENTS sell made to measure gabardines, whipcords, $14.50; reversible raincoats; $75-$100 weekly. Outfit free. Standard Raincoat, Dept. 5, 129 West 17th St., New York.

DELICIOUS Desserts—$1.00 an hour selling Stuart's delicious desserts, pudding powders and pie fillers. Write for terms and free samples. C. H. Stuart & Co., 5867 B'way, Newark, New York.

AGENTS, sell shoes direct to ladies at home or at work. Fast selling line. Liberal pay. Splendid opportunity. Apply Now. Style-Arch Shoe Company, 503 Butler Bldg., Cincinnati, Ohio.

AMAZING auto necessity. Retails $4.00. Your profit $2.50. Territory going. Write Super, 1306 Fondulac, Milwaukee, Wis.

AGENTS: New product no equal. 150% profit. 100% Repeater year round. Sells to everybody. Astounding results from first day. Surety Manufacturing Co., 26 W. Washington, Chicago.

AGENTS—W. F. Omeis, a former brush salesman, made over $5,000.00 during 1922 selling our $1.50 kitchen specialty. He is now a district manager. We are offering you the same proposition—an opportunity as big as you want to make it. You can do what Omeis did. Write today to M. H. Tyler Mfg. Co., Manager's Desk, Muncie, Ind.

RUMMAGE Sales make $50,000 daily. We start you. Representatives wanted everywhere. "Wholesale Distributors," Dept. 92, 609 Division Street, Chicago.

DUSTLESS Sponge Cloth. New Invention. Retails (50c)—Costs (16c). (1) Rub Cleans, Polishes Automobiles, Pianos, Furniture. NuLife (A) Sponge, Hartford, Conn.

EVERY home a prospect. Zenith Cleaner and Polish for Automobiles and Furniture. Agents make 100%. Sample 25 cents, refundable first order. Absolute repeater. Zenith Products Company, 202 Clay Ave., Rochester, N. Y.

AGENTS: Vacuum Portable Heater—pumps cold air off the floor at ¾ cent per hour. Every cent will return 100 per cent heat in rooms. Everybody write. Vacuum Portable Heater Co., 108 Main St., Tarrytown, N. Y.

$100 WEEKLY is nothing unusual for men and women selling the Kelly Chemical Indoor Closet. Has given service and satisfaction for more than 15 years. Easily sold to every suburban, rural and farm home without sewer connection. No plumbing, carpentry, waterworks or cesspool. Easier to install than a stove. We now have a better article at a lower price with a bigger profit. Write—Kelly Mfg. Co., 4204 W. Adams St., Chicago.

MAKE Big money selling rubber rugs, duplicating rag rugs in appearance; every home a prospect. Write or wire Trump Bros. Rubber Co., Akron, Ohio.

AGENTS Easy Money. Interview motorists—Patented instrument Every motor Needs—It Saves Money Three Ways—Guaranteed. Thousands "Sold." Glad Users Everywhere. Big demand at your door. Pleasant work. Permanent business of your own—employ sub-agents—$75.00 weekly up, all or part time. Experience unnecessary. This is a high class money-making proposition—Your opportunity for success. Whatever you do answer this ad quick. Wizard Mfg. Company, 453 Central Ave., Rochester, N. Y.

GENERAL Distributors—Make $100 to $150 weekly as Distributor for World's Greatest Automobile Polish. Easily demonstrated, wonderful results, sure repeater. Sell to consumers, sub-agents, dealers. Big money-making proposition to hustlers. Write quickly for exclusive territory. The Armo Mfg. Co., N-130 Goodale, Columbus, Ohio.

MAKE $25 to $50 Week, representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 31, Philadelphia, Pa.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 46, East Orange, N. J.

PORTRAIT and Medallion Agents—Our Goods Will Make You Big Profits; delivery guaranteed; prompt shipments; low prices; send for latest catalog. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago.

SELL everyone an Auto-Oil-Tester—Quick sales—Big profits—Sample $1.00. Viscositor Mfg. Co., Toledo, O.

BIG Steady Income. No investment. Protected territory. Sell Harper's ten-use brush set. Sweeps, scrubs, washes windows, cleans walls, etc. Big seller 14 years. Scores making up to $30 daily. Investigate this. Harper Brush Works, 132 D St., Fairfield, Iowa.

PORTRAIT agents earn big money selling our Photo medallions. Photo medallion clocks, Religious medallions, Photo pocket mirrors, Photo buttons, Photo jewelry, and Fraternal Photo medallions. Send for free catalogue. Satisfaction guaranteed. Four-day service. Address Gibson Photo Jewelry Co., Apartment 7, 608 Gravesend Ave., Brooklyn, N. Y.

AGENTS make $180 a month. Brand-new hosiery. All styles for men, women, children. Must wear or brand new hose free. Finest silk hose. Written guarantee with each pair. Orders filled promptly. Write for outfit. Jennings Mfg. Co., Dept. 1068, Dayton, Ohio.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission Factory PM, 519 No. Halsted, Chicago, Ill.

27,000 RECORDS guaranteed with one Everplay Phonograph Needle; new—different; cannot injure records; $15.00 daily easy. Free sample to workers. Everplay, McClurg Bldg., Desk 126, Chicago.

AGENTS—The Big Seller of the year is the Universal Jar Opener. Has many uses. Sells for 50c. Costs $2.00 dozen prepaid. Sample 25c. We offer agents the largest line of steel and wire specialties on the market. General Products Company, 7 Oliver Street, Newark, N. J.

AGENTS—Make big money selling Earl's "Cutwell" Imported Pocket Pencil Sharpener. Sample 15c prepaid. Sells on sight. B. G. Earl, 56 E. Randolph St., Chicago, Illinois.

SALESMEN—Get into the tailoring game—one of the most profitable of all specialty selling fields. Experience not necessary. We show you how to take measures, teach you how to sell our line and supply you with everything necessary to go out and make from $10.00 to $20.00 a day from the very first day. Our selling outfit is the finest of its kind ever gotten together and shows more than 100 large cloth samples of finest woolens. You do no delivering. You just write your orders. We do the rest. Your profits run big and you get them cash with order. If you want to get into this most profitable of all lines, write us quick. Address Dept. 702 Goodwear Chicago, Inc., 844 W. Adams St., Chicago.

AGENTS: Big money Monogramming by Transfer Method. Catalog Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

EIGHT Dollars for seven hours! Peck's Rivets quickly mend leaky kitchenware. Sell everywhere on sight. Samples free. Box 25c. Peck Company, 7 Medina, N. Y.

AGENTS: $16 a day. Latest improved portable talking machine. Does more than machines costing five times its price. Built-in just like a suitcase. Fully guaranteed. Pay you daily. Write Perry-Ludlow Co., S-1962, Dayton, Ohio.

INSTANT Weld. Repairs largest punctures without cement or heat. Lenn's profit one day, $56. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

AGENTS Everywhere! Women's and children's guaranteed shoes direct to wearer. We deliver. A. P. Condon, Sales Manager, The Allen Shoe Co., 110 Summer St., Boston, Mass.

NEVERUST cutlery agents make big money. Whole or spare time. No capital or experience required. The C. Westchester Co., 92 Park St., Yonkers, N. Y.

BIG Profits Selling New $3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458-A Hollywood Ave., Chicago.

AGENTS: $75.00-$100.00 weekly taking orders for popular price-smashing raincoats, $3.98. Largest commission advanced. Prompt shipment. We collect. Free coats. Eagle Raincoat Co., 588 Mid City Bank Building, Chicago.

CAN you sell Ford size tires at $3.50 each? Write for plan. Details free. American Auto Accessories Co., Sales Dept. 78, Cincinnati, Ohio.

WONDERFUL discovery. Charges batteries in ten minutes. Gallon free to Agents. Radiolite Co., St. Paul, Minn.

AGENTS—Our soap and toilet article plan is a wonder; get our free sample case offer. Ho-Ro-Co., 2725 Dodier, St. Louis.

PHOTO medallion salesmen: Earn $100 to $200 every week selling P. & G. Photo medallions. No investment—free equipment. Guaranteed 4-day service—send for sales plan and free 1923 catalogue with 102 beautiful designs, including clock and religious medallions. Pudlin & Goldstein, 259 Bowery, Dept. A, New York.

FREE sample new embossed signs. Ready sellers to all kinds stores. 300 percent profit. Make $75 weekly. National Display Signs, 18 W. 34th St., New York.

AGENTS wanted to sell electrical flower vases. Consists of 9 roses with light in center of each and rustic vase 5 feet high, of natural-bark appearance. Sells on sight. Agents now earning $20.00 to $50.00 daily. Write for full particulars. Rustic Basket Company, 1820 Grand Ave., Chicago, Ill.

AGENTS. Make $10 to $20 daily, selling small kitchen necessity. Over 200% profit. Sells rapidly everywhere to nine out of ten women. New plan make sales easy. Premier Mfg. Company, Dept. 813, Detroit, Mich.

MEN and Women—Sell "Never-Burn" hot plates; prevents loss of food by burning; used on any stove; endorsed by hospitals, cooking schools and thousands of users; easily sold; no competition. Write for particulars or send $1.00 for sample plate and proposition. World Specialty Co., 4014A Benton, Kansas City, Mo.

SELL Auto Quickstart—a new sensation! Starts motor instantly in cold or foggy weather. 8 other rapid sellers. No investment. Big money easy. Write Jubilee Co., 13 Sta. C, Omaha, Nebr.

AGENTS: If you want the biggest, cleanest cut and snappiest money-making proposition you can find anywhere in the entire U. S. A., you will write today for the convincing facts. Nothing like it—A Necessity, patented and Guaranteed—Every motorist a "live, enthusiastic prospect." The work is pleasant and easy, and immensely profitable. Experience unnecessary. All or part time. If $6.00 an hour or $100.00 weekly interests you—Write quick for territory. Wizard Division, Seneca Camera Mfg. Company, Rochester, New York.

AGENTS—$1.25 an Hour Spare Time Near Home. Light, pleasant work, showing samples and distributing tea, coffee, extracts, spices, food products, things people eat, 19 full-sized packages and complete outfit to first person in your locality answering. Write quick. Dept. 92, Harley Company, Dayton, Ohio.

MAKE $17 daily—Finest Extracts, Food Products, Toilet Preparations, Household Necessities. Credit; Sample case Free. Write for amazing offer. Perkins Products, B-6, Hastings, Nebr.

WE Start You In Business. Good money operating our business leads. No experience required. Manufacturer furnishes everything. Cherokee Sales Company, Department P, M., Danville, Va.

EVERY Superior Outfit sold brings repeat orders that average $25 a year. Selling three outfits a day, you have a $25,000 a year business, of which half is profit. Send for particulars of the biggest repeat order proposition on earth. Lea Brothers, 145 East 23rd St., New York.

SELF-THREADING Needles find sales in every home. Fine sideline, easy to carry. Big profits. Sample free. Prentice-Lee, 145 East 23rd St., New York.

MAIL-ORDER houses and distributors: we pack big profit beauty creams, face powders, perfumes, toilet preparations with your label. Chemist, 944A No. Clark, Chicago.

AGENTS get Klosquik, the newly invented door spring. Whirlwind seller. Retails for 50c. You make 100% or more. Sell 50 to 80 a day easy. Write for 45c sample and easy starting offer. Klosquik Mfg. Co., Dept. A, 17 West 42nd St., New York.

AGENTS, both sexes, we manufacture and control new household article. Fast seller. Big profits. Exclusive territory. Write now. Connolly, 123 Liberty St., New York.

BOYS, Girls, Men, Women, Everywhere. Big profits selling the Hatsaver. Protects any hat from rain, snow and dust. Weight one ounce. Carried in any hand bag. Three samples and instructions 25c. To be first in your territory send $7.35 for one gross, postpaid. R. D. King, 302 South Dearborn, Chicago.

"SPICE-BOX." Imported novelty. $25 daily easy. Sample 25c. Artcraft, Box 53, Omaha.

FLORIST'S Plant Food Prevents disease. Big profit. Four ounces 25 cents. DeMuth, Camden, Mich.

AGENTS: $60 a week selling guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles and colors, including finest line of silk hose. Mrs. McClure makes over $2,000 a year. Mrs. Schurman averages $60 a month working spare time. Geo. Noble made $35 in one day. Write for sample outfit. Thomas Mfg. Co., Class 562, Dayton, O.

AGENTS—Finest line of silk hose you ever saw. Latest styles and colors. New style guaranteed hosiery for men, women, children. Must give satisfaction or new hose free. Write for samples. Parker Mfg. Co., Sample 278, Dayton, Ohio.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchant's signs, water-proof and tea aprons, guaranteed hose, toilet requisites, luminous crucifixes; catalog, 50 specialties free. 30 days' credit. Jas. C. Bailey Co., Desk M 12, Chicago.

A SERVICE agency for magazine and newspaper classified advertisers. Complete advertising service free of charge. We edit and place your copy. Send for our free lists and explanation. Sweet & Phelps Advertising Agency, 214 E. Ohio St., Chicago.

AGENTS, Sell newest Christmas decoration; tremendous sales last year. Holiday Supply Co., 807 Harrison St., Chicago.

AGENTS—Greatest Selling Specialty. Arsenal Laboratories Company, P. O. Box 43, Arsenal Sta., Pittsburgh, Pa.

AGENTS Wanted—to handle the Hughes Airtight Valve Cap. This cap replaces ordinary caps on inner tubes, and is guaranteed to let no air escape. Big commissions on this easy-to-sell accessory. Write today for information. See our display ad on page 175. Airlox Rubber Company, 2052 Jackson Boulevard, Chicago.

WHY Work for others? Start and operate your own business. Our system proprietary specialty business offers wonderful opportunities to make $100 to $500 weekly. Openings everywhere. We furnish everything and show you how. Booklet free. National Scientific Laboratories, 208 Monroe, Richmond, Va.

MAKE $31.00 Profit—Cost You $1.50. Complete Gold Monogramming Outfit. Transferred Instantly on Automobiles, Trunks, Bags, Windows. Experience Unnecessary. Free Samples. NuLife (A) Monogram, Hartford, Conn.

TAILORING Agents—We've got a wonderful line of tailor-made suits to sell at $18 and up. Beautiful assortment of fabrics. $10 to $25 cheaper than retail. No experience needed. Our free suit offer is a wonder. Write American Woolen Mills Co., Dept. 1852, Chicago, Ill.

WE pay $8 a day taking orders for Insyde Tyres. Guaranteed to prevent punctures and blowouts. Double tire mileage. Any tire. Tremendous demand. Low priced. Write quick for agency. American Accessories Co., B278, Cincinnati, Ohio.

MAKE $1000 monthly distributing our products. Big profits. Guaranteed sales. Exclusive territory. Permanent business. Write quick for particulars. Yonover, 1657 A12, Roosevelt Rd., Chicago.

AGENTS, Salesmen, Demonstrators, you will have the devil's own time trying to find a better seller than "Zippe." If there was such a thing we'd have it. Splendid profit on 50c "Go Getter" repeat article that sells on ten second demonstration. Works While You Watch It. Demonstrates value, while others waste time making claims. New Discovery! Greatest Scientific Triumph of the age. It's the berries. Haven't room to tell our story here. Write immediately. Karam-Smith Co., 612 Bozan St., Ft. Wayne, Ind.

AGENTS—$15 a day—Easy, quick sales—Free Auto—Big weekly Bonus—$1.50 premium Free to every customer. Simply show our Beautiful 7-Piece Solid Aluminum Handle Cutlery Set. Appeals instantly. We deliver and collect. Pay daily. New Era Mfg. Co., 803 Madison St., Dept. 21-U, Chicago.

AGENTS "Cleaning Up." Housewives everywhere talking about wonderful new invention—Perfection Pressure Cooker. Saves money, time, labor. Easy to sell. Write quick. Jubilee Mfg. Co., 33 Sta. C, Omaha, Nebr.

HEATING with oil is in its infancy. Get in while the getting is good. Our burners make good. Agents wanted. Exclusive rights. Economy Oil Burner Co., 718-721 Second St., Webster City, Iowa.

THE wonderful arch support and shoe preserver, for every shoe; unequaled for agents. S. M. P. Co., 359 Pearl St., New York.

EASY Money. Sell 35c article with $25.00 Guarantee. 100% profit. Wun-der Re-Mov-R, Pittsfield, Mass.

"HOW to Sell Patents" free. Patent News-O, Washington, D. C.

NEVA-LOST Gas Tank Cap for Automobiles sells on sight; 100 per cent profit. Big opportunity for producers. State territory desired. Trinity Mfg. Co., Hartford, Conn.

TAKE orders for Bleacho—the new amazing preparation for lightening skin. Enormous demand by colored people. Guaranteed to satisfy. Nationally advertised. Going like wildfire. Live agents earn from $50 to $200 a week easy. Write now for exclusive territory. Superior Drug Sales Co., 4909 Broadway, Chicago.

$10 AND more daily easy. Selling household necessities direct from manufacturer to consumer. Write 507 Commercial Bank Bldg., Cleveland, O.

ABSOLUTELY free box Bassett's Native Herbs sent to introduce. For Constipation, indigestion, headache, rheumatism. Big money selling, all or part time. Established 1879. Bassett, Dept. I, Columbus, Ohio.

AGENTS, Sell Anti-Mist Compound. Keeps rain and steam off windshields and eye glasses for 24 hrs. Send 25c for sample and particulars. A. W. Brust, 210 S. Seeley Ave., Chicago, Ill.

AGENTS Wanted—Full or part time, to sell on liberal commission new Thermostatic Automatic Carburetor Control Attachment for Ford cars. Increases mileage 100%. No holes to drill. Attached in two minutes. Does automatically exactly what Ford Manual instructs driver to do. Cadillac Car now using Thermostatic Carburetor Control under Blancke license. Write immediately, Blancke & Co., 602 W. Lake St., Chicago.

ANY man handy with paint brush or light tools can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

SUCCEED With Your Own Products—Formulas, Processes, Trade-Secrets. Different, dependable, profitable. Catalog free. B. Thaxly Co., Washington, D. C.

LEATHER bill folds 50 cents. Agents wanted. Universal Sales Company, Box 152, Springfield, Ill.

WRINGER Mop—We have the best wringer mop made and can offer high-grade mop and brush salesmen exclusive territory and liberal profit. M. C. Newton, 1338 West 104th, Cleveland, Ohio.

SALESMEN and Agents: New Auto Accessory good for $100.00 per week. Eureka Engineering Co., Box 1512, Rockford, Ill.

PATENTS Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free Booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 310 Security Bank Building, Directly across the street from Patent office, Washington, D. C.

WE have the finest needle case. $50.00 to $200.00 weekly. Send 10c for sample; sells 25c. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago.

YOU can be your own boss with our Key-Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

WONDERFUL Little Article; something new; make it yourself; men and women make $15 daily; experience unnecessary; article cost 5c, retail $1. Particulars Free. Taylor's Novelty Shop, Columbia City, Ind.

AGENTS—Go into business for yourself. Be your own boss. Work for yourself, not the other fellow. No traveling. Start manufacturing or mail order business in your own town. Write for particulars. Central Book Co., 127 South Liberty St., Indianapolis, Ind.

BUILD a lasting business in your own community, with the Waterizer—big profits—cumulative—clean cut. James B. Lund, Manufacturer, 19 S. La Salle, Chicago.

MAKE $8 a day selling Imported Bamboo Fountain Pen. Whirlwind seller. Free sample. Mohler, Dept. 5, 416 S. Dearborn, Chicago.

AGENTS—Advertising Pencils, Ready Sellers. Excellent side-line. Write for proposition. North American Pencil Works, 32 So. Clinton St., Chicago.

PORTRAIT Agents. Linder Art Company is known the world over for Good Work. Exact Likeness. Speedy Service. We make a portrait that delivers without schemes, kicks or arguments. Your customer pays you cheerfully. Try us—seeing is believing. Linder Art Company, 549 Washington St., Chicago.

$50 DAILY! Automotive invention sells like wildfire! $3. Free newspaper advertising over your name as agent makes success positive! Official test by Automobile Club of Missouri shows 63% more miles per gallon gasoline! Write quick. Philis Mfg. Co., St. Louis, Mo.

AMAZING new ways to make money: Every issue of Opportunity contains over 50 pages of money-making ideas. Send 10c now for sample copy. Opportunity, 407 Webster Bldg., Chicago, Ill.

AGENTS—Distributors—make easily $100 to $200 a week. Be a "PlieRench Man." Get into a permanent business with growing profits. Sell the marvelous Eifel-Flash PlieRench Tool Kit—Guaranteed to Do The Work better, quicker, and easier of 60 pounds of the best other tools costing $50.00. Only kit that does all work around Home, Car, and Shop. Weighs 1½ Pounds. Sells quickly, when shown, at $5.50. On market 3 years—thousands sold. Extra good for agents with cars. Fine side line—carry in pocket. State how you sell, territory wanted. The Flash Sales Corp'n., Dept. Q., 4809 North Ashland Ave., Chicago.

EMBLEM Goods are fastest Xmas sellers. Wall and auto emblems, buckles, billfolds, cigarette cases, jewelry. Kier Emblem Co., 450 Como Bldg., Chicago.

AGENTS—OPPORTUNITY of a lifetime. $500.00 per month easy with our Met'l Fibre Autowline. Every auto owner wants one. Exclusive territory. Send $1.50 for sample. Met'l Fibre Rope Co., 1817 Vermont, Toledo, Ohio.

WONDERFUL Scientific Discovery: pure "White Sapphires," rival finest diamonds, $2 carat. "Rainbow Sapphires" changes color, greenish purple to ruby red, $2 ct. "Meteor Sapphires" like golden diamonds, $2 ct. Pearls, Amethysts, Diamonds, solid gold mountings; also Imitation Diamonds; wholesale prices; be our Agent. Pauer (Importer), 152 Dewitt, Buffalo, N. Y.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

AUTO Safety Signals—Every Auto owner wants it. Easy Seller. Every Auto owner Recommends. Agent's cost $1.25, Retails $5.00. Perfect working services guaranteed every user. Press Foot, Brake Automatically flashes bright red warning light to rear. First Dozen ordered secures exclusive sales rights any uncontracted county. Agent's Price $15.00 Dozen Delivered. Postage Prepaid. Automatic Signal Co., 701 Berger Bldg., Pittsburg, Pa.

A BUSINESS of your own: Make sparkling glass name plates, numbers, checkerboards, medallions, signs; big illustrated book free. E. Palmer, 307, Wooster, O.

FLEXIBLE Steel wire Carbon Scraper. Good side line. Order sample, 60c. Be convinced. Marshall, Box 724, Springfield, Mass.

RUSSIAN, German, Austrian, Soviet money. Sensational sellers. Cheap, attractive giveaway advertising for Agents, Merchants. Big Circular Free. 100 banknotes $2.00, splendid assortment. Hirsch Importing, 847 Huntspoint Ave., New York.

AGENTS—Send for sworn proof of $5 to $15 daily—Introducing New Style Guaranteed Hosiery. 57 styles, 17 colors. No capital or experience required. Just write orders. We deliver and collect. Your pay daily, also monthly bonus. Free auto offer besides. Complete outfit furnished. All colors—grades including silks—wool—heathers. Mac-O-Chee Mills Company, Desk 25612, Cincinnati, Ohio.

AGENTS—Big Money, Fire extinguishers for automobiles Retails ($1.50). Send stamp for reply. F. & S. Extinguisher Co., 10th and Perry, Erie, Pa.

AGENTS—Best seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 800 per cent; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

FOUR $7.50 Sales to Merchants Net you $20.00 Daily. Sayer Systems, 2815 Sheffield, Chicago.

WHY Work for others? Start and operate your own business. Our system proprietary specialty business offers wonderful opportunities to make $100 to $500 weekly. Openings everywhere. We furnish everything and show you how. Booklet free. National Scientific Laboratories, 203 Monroe, Richmond, Va.

EARN $10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decie Laboratories, 1133 Broadway, New York.

WANTED—Tailoring salesmen, make $60 to $125 per week. Biggest merchants in many towns have started with our lines. We are the largest made-to-measure tailoring house in the country, furnishing elaborate sample equipments, including 500 all wool fabrics and guaranteed absolute satisfaction, perfect fit, best workmanship, or no sales. Write me for line and all accessories to be sent free. Tell us all about yourself. Address G. H. Mitchell, Sales Manager, Box 483, Chicago, Ill.

MAKE $20 to $30 a day selling electric lighted Flower Baskets and illuminated Xmas Wreaths. Every home and store a prespect. Send for samples Today. Basket $6.50, Wreath $3.00 postpaid. Bromberg, 150 E. Grand Ave., Chicago.

HELLO Boys! A Message from the Salesmen of the Alexander Film Company: We are members of a square shooting, smiling, fighting firm that treats a fellow like a partner. Selling Motion Picture Publicity that is par with big feature productions in art and settings. Advertising and Sales Course, familiy spirit. You know what that means. Come on, join us—we are challenging only permanent fighters who demand big income for consistent efforts. Alexander Film Company, 3389 So. Broadway, Denver.

SUCCESS in Business and Personal Affairs! Read character by handwriting and features. Conlin System. Low price for entire course. Write. H. E. Conlin, Dept. B, 21 St John's Place, Buffalo, N. Y.

PORTRAIT Agents and Others. Get Big Profits. Sell Perry Photo Medallions. You charge $2.98; make 400% profit. $10 daily easy. Big exclusive line. 4-day service. Perry Photo Novelty Corporation, Section 16, 360 Bowery, New York.

AGENTS—If you have formerly sold felt rugs, write for our new proposition concerning new goods. It's a winner. Newark Felt Rug Company, 27-C 16th Ave., Newark, N. J.

EARN big money fast applying gold initials to autos. Every owner buys—$1.35 profit on $1.50 sale—particulars and samples free. Write quick. Lithogram Co., Dept. 17, East Orange, N. J.

OUR Ex-Cel Luminous Crucifix "shines brilliantly in the dark." Sells on first demonstration. Big profits. Free Selling Talk with first order. W. B. Hannan Co., Dept. B, 57 E. 18th St., Chicago.

CHRISTMAS Greeting Cards—Make $100.00 weekly. Spare time. Wholesale Prices. Manufacturer, 1235 Arch, Philadelphia, Pa.

MAKE Big Money. Spare or full time. Everybody loves Popular Music. Few hours a day with unique plan builds cumulative income. Representatives cashing in. Reserve territory. Get particulars quick. Crocker-Steinkamp, Dept. C-12, Quincy, Ill.

AGENTS. Make Money; sell California Specialties. Sample 25c. W. Bedell, 789 So. 18th St., Newark, N. J.

AGENTS: Can start you in Mail Order Business Immediately. Been at it 17 years. Small capital needed. Particulars stamp. Home Business Expert, Valdosta, Ga.

KAPFORM holds soft caps in shape. Neat, Dressy, Easily attached. 25c, Six $1.00. Kapform Agency, 3518 Ellis Av., Chicago.

PLENTY of money, plenty of leisure, a fine home, and a fine car, with freedom from financial worries, representing us as our General Agent in your district. For one of the best propositions ever offered an agent. Address: The Horsey-Bassett Co., Inc., Dept. P, Crisfield, Md.

AGENTS—Easy sales. Every woman and girl live prospect for my beautiful manicuring set. Write quick. Miller, Sales Mgr., 643 E. 61st, Chicago.

WE pay $50 a week and expenses and give Ford auto for men to introduce poultry and stock compounds. Imperial Co., D-23, Parsons, Kan.

JUST out—new auto invention—selling like wildfire. Make $25 to $40 day easy. Exclusive territory. Great opportunity for general agents. Nothing like it. Write quick to Nelson J. Quinn, Sales Manager, Toledo, Ohio, for details.

AGENTS—Ladies silk and wool hosiery, $2.00 per pair; silks, $1.25 pair; over 60% commission. 18 patterns men's silk knit ties in Christmas boxes, over 80% profit. We deliver. Dept. 1046, The Lexington Company, Lexington, Ky.

QUICK seller to every owner of a passenger car or truck. Easy to demonstrate. No experience necessary. Ten dollars and more a day taking orders for the Warner Oil-Gat. It turns what is now hard, long, dirty job of lubricating a chassis into a quick, easy, clean job. Nationally advertised and guaranteed by inventor of famous Warner Speedometer. Sold on money back basis. Send $3 for your demonstrator. Immediate and permanent profits. Our selling plan insures your success. Get all the facts. Write at once Warner Patterson Co., 914 South Michigan Avenue, Chicago.

DARN E-Z. Universal Fabric Patching Cement; sells to nearly everybody again and again; now uses command instant attention. Special selling system assures generous income. Dept. P-M-1., Darn E-Z Lab., Mutual Home Bldg., Dayton, Ohio.

AGENTS Make $25.00 spare time, $50.00 up weekly full time. Staple necessity; every home prospect. Cost $1.50, sells $5.00. High class guaranteed product. Address New Vision, Care General Delivery, Charlotte, N. C.

350% PROFIT makes 8 to 10 dollars daily. Samples free. Brighton Co., 3950 No. Ashland Ave., Chicago.

AGENTS: Where to buy 12,000 articles Wholesale. Actually worth $50. Enclose stamp. Wholesale Supply Co., Valdosta, Ga.

AGENTS, Distributors, Energetic Men everywhere earn $10 daily handling the HyKon Sewing Machine Belt; a new household necessity; sells on sight to homes, dressmaking and tailoring establishments. Be first; get this money-maker; put out sub-agents. Opportunity folder free. Hy-Kon Mfg. Co., Alliance, Ohio.

PAY Your Way Anywhere with Oriental Mystic Rings. People amazed at these values. Sterling sample ring $1. Sells for $2.50 up. Orient Exchange, 21-P Park Row, New York.

AGENTS: Big returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

BIG, Quick Money for agents, distributors, men and women everywhere; good for $10-$15 daily; everybody buys; rapid cash sales; repeat orders come fast; your opportunity for permanent business; samples, circulars furnished free. Send for facts without fail. Paul M. Smith, Kutztown, Pa.

AGENTS sell made to measure gaberdines, whipcords, $14.50; reversible raincoats; $75-100 weekly. Outfit free. Standard Raincoat, Dept. 5, 129 W. 17th St., New York.

RAINCOAT Agents. Get Our Prices. Sell made-to-measure raincoats. We deliver and collect. Outfits free. World Raincoat Co., 659 Morris Park Ave., New York.

CHEAPEST Self-Wringing Mop made. Big Seller, 100% profit. Easiway Company, 405 St. Paul, Baltimore, Md.

AGENTS—Steady Income. Large manufacturer of soaps, perfumes, toilet articles and pure food products, etc., wishes representatives in each locality. Manufacturer direct to consumer. Big profits. Honest goods. Whole or spare time. Cash or credit. Send at once for particulars. American Products Co., 9846 American Bldg., Cincinnati, Ohio.

HIGH-GRADE SALESMEN WANTED

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

SALESMEN Can make $5.00 a day selling our Calendars, Pencils, Signs, Advertising Novelties, Yardsticks, Whistles, etc. Liberal terms. Sells entire year. Fine side line. Local and traveling agents. Model Calendar Co., Dept. 226, South Bend, Ind.

BARNES makes $30.00 daily selling "Zim's Peerless"—the "humdinger." Collection Service. So can you. Merchants reorder constantly. Creditors' Association, E-312 McKnight Bldg., Minneapolis, Minn.

$742 LAST month for Beck of Buffalo, introducing latest advertising plan; nothing else like it; every merchant wants it; easy sales; no deliveries; no collections; specialty salesmen write quick for offer. National Adv. Service, P. O. Box 50, LaGrange, Ind.

SALESMEN Wanted—Local or traveling, part or full time, to sell calendars, fans, fly swatters, brushes rulers, etc. Over two hundred stock designs of paraffin signs, ice cards, etc., for all merchants. Fine side line, liberal commission. The Harrison Co., Union City, Ind.

TAILORING Salesmen—Fastest selling line, suits, overcoats, made to measure—$29.50—one price, all wool. Profits in advance. Biggest old reliable house. W. D. Smith & Co., Dept. 66, Established 1895, Chicago.

SPLENDID proposition—sell gummed tape. Rapidly replacing twine. $50.00 to $150.00 weekly—full or part time. Sager Company, Manufacturers, Dept. S 112, 1637 Roosevelt Road, Chicago.

TRAVELING Salesmen calling on retail stores wanted by large manufacturer to sell unique line of business-boosting articles. Year round, fast selling, main or side line. If not earning $150 weekly, address Eisaser Works, 222 Charles St., Boonville, N. Y.

SPECIALTY Salesmen, sell the Wonder Bag "5 in 1," and the Night Light Vanity. Large profits, quick sales. Write for full details and protected territory. The Universal Leather Goods Co., 446 N. Wells St., Chicago, Ill.

WANTED, high-grade man as salesman distributor. A timely opportunity. A paying proposition. This is not an "investment proposition" or "door bell ringer" job, but an attempt to find right man in each town or city to represent nationally advertised household article. Write or wire Crown, Richmond, Ind.

SALESMEN Make $120 Weekly. Free Radio Instrument. Ozarka is longest distance receiver. Introduce it to your friends and secure your own free. No canvassing. 2 sales weekly nets you $120. Sharpe of Colorado made $955 one month. Our plan sweeping country. Write today giving name your county. Ozarka, Incorporated, 892 Washington Blvd., Chicago, Ill.

SALESMEN—Become Independent. Own your business; experience unnecessary; selling our $7,500 Accidental Death, $50 Accident, $25 Sick Weekly Benefits; $12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. A, Newark, N. J.

SALESMEN: If You Want $6,000 This Year, write now. Strong line for retail stores. Nationally advertised; established concern. Liberal weekly advances to producers. George R. Williams, 1920 Euclid, Cleveland, Ohio, Dept. 200.

SALESMEN—Sideline pays five to ten dollars a day taking orders for Specialty printed gummed advertising and Match Box Stickers. Write for proposition, samples, etc., today. Beardsley's Printery, Rock Island, Ill.

WERE You Ever Offered a Grocery Store? Our Proposition Is Better. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee and entire line of Groceries, as well as Paints, Roofing, and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

$4.00 PROFIT on Every $5.00 sale. "Free Sample"—New Specialty. (Money Getter.) Every Storekeeper, Doctor, buys quickly. Experience unnecessary. Territories open. Box 596, Hartford, Conn.

SALESMEN—You can easily make $40 to $80 weekly taking orders for best fitting, rich looking, all wool, made to order men's suits and overcoats (guaranteed) $18.50 and $27.50; each garment "Larvex" Moth Proofed; same goods sells in retail stores at $35-$50; we deliver, collect and furnish advertising. Tailoring experience unnecessary. Outfit shipped for free examination. Wholesale Direct Tailors, Dept. 100, Buffalo, N. Y.

DISTRICT Salesmen with car to call on the hotel, restaurant, drug, grocery, variety, hardware and garage trade. Selling products of The Plymouth Chemical Co., Plymouth, Ind.

SALESMEN—You can make $130 per month in your spare time selling only one policy a day! Five policies a day pays you $730 monthly! Policy pays $5,000 death and $25 weekly benefit for sickness or accidental injury. Total cost $10 yearly. You get amazing results using our Direct-By-Mail Selling Plan. Write quick for territory. Underwriters, Dept. RL, Newark, N. J.

SALESMEN—We pay larger commission than any other Brush House in the Country to men selling our line of Sanitary twisted-in wire Brushes. Sanitary Wire Grip Brush Co., 15-17 Mercer St., New York.

WORLD'S Fastest Selling Auto Accessory! County distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, Calif.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Factory SP, 519 No. Halsted, Chicago, Ill.

SALESMEN—Crew Managers. You will have the devil's own time trying to find a better seller than "Zippe." If there was such a thing, we'd have it. Splendid profit on 50c "Go Getter" repeat article that sells on ten second demonstration. Works While You Watch It. Demonstrates value, while others waste time making claims. New Discovery! Greatest Scientific Triumph of the age. It's the berries. Haven't room to tell our story here. Write immediately. Karam-Smith Co., 6612 Bozan St., Fort Wayne, Ind.

1,000 DOLLARS Monthly Proposition. Particulars Free. A. Davis, 1637 Roosevelt Road, Chicago.

OFFICE Specialty—Costs 25c; sells $1. Many buy hundreds. Big profits. Exclusive rights. Mfgr., 3240 N. 13th St., Philadelphia.

WHY Work for others? Start and operate your own business. Our system proprietary specialty business offers wonderful opportunities to make $100 to $500 weekly. Openings everywhere. We furnish everything and show you how. Booklet free. National Scientific Laboratories, 208 Monroe, Richmond, Va.

ASKO—Salesmen to sell Auto Acc. as side line; can carry sample in vest pocket; sells on sight. Big comm. Write for sample. Allen Specialty Co., 2751 West Lake Street, Chicago.

SALESMAN Wanted. Amazing Invention—almost human. The Little Draft-Man—a wonderful labor-saver, automatically opens furnace or boiler while owner sleeps. Pays for itself in fuel saved. Simple, efficient, can be installed by anyone in five minutes. 100% profit. Thousands being sold. $25 daily easily made. Act quick. Address: Little Draft-Man Co., Dept. A, Grand Rapids, Mich.

$4 MADE on $6 sale retail, $12 on dozen sale to garage. Sunbeam Indicator is a beautiful and useful automobile radiator meter. Weight, one pound. A new selling plan. A fine side line. Write for sample. Sunbeam Co., Milwaukee, Wis.

BEST Seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, guaranteed to last life of tire or tube; sells to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa., Dept. 510.

PULLEMUP Kuff Buttons—Marvelous Convenience — shirt savers — Fifty other Jewelry specialties that Sell to Retailers. Sideline Salesmen Wanted. Flexo, Sheboygan, Wis.

HELP WANTED

RETIRED Railway Postal Clerk writes: "My proudest moment was when telegram came to report for Duty in Uncle Sam's Mail Cars. Wish I could live it over again." You can experience that "proud moment" by preparing for Railway Postal Service. Start $133 month; railroad pass; hotel expenses paid. Hold your present job and study for examination held near you. When ready, cut loose and take better job with Uncle Sam. Chance to run on railroad through your town. Older men retiring with pensions. Young men must take their places. Why not you? Test examination free. Columbus Institute, E-17, Columbus, Ohio.

YOUNG Men Wanted at once. Become Draftsman and earn $50 to $100 a week. No experience required. Big demand; splendid opportunities; clean work. Learn in spare time at home. Send for our Free Book. Just out. No charge. Address: Department 2240, Chicago Tech., 118 E. 26th St., Chicago.

WANTED—Men 18 up. Commence $133 month. Steady. Railway Mail Clerks. Travel, see country. Schedule examination places—free. Write immediately. Franklin Institute, Dept. D-20, Rochester, N. Y.

WHY Work for others? Start and operate your own business. Our system proprietary specialty business offers wonderful opportunities to make $100 to $500 weekly. Openings everywhere. We furnish everything and show you how. Booklet free. National Scientific Laboratories, 208 Monroe, Richmond, Va.

FIREMEN, Brakemen, Baggagemen, Sleeping car, train porters (colored). $140-$200. Experience unnecessary. $10 Railway Bureau, E. St. Louis, Ill.

MEN Wanting Railway Station-Office positions with transportation furnished, experience unnecessary, write quick. Baker, Supt., Dept. 74 Wainwright, St. Louis.

WANTED By U. S. Government, Railway Postal Clerks. Men—boys, 18 to 35. Steady work. Commence $133 month. Quick raise to $192 month. Travel, see the country. Life position. Paid vacation. Experience unnecessary. Common education sufficient. List positions obtainable and schedule examination places—free. Write Franklin Institute, Dept. D-3, Rochester, N. Y.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-C. North Clark, Chicago.

WANTED: Railway Mail Clerks—$1,600 to $2,300. Exams everywhere. Write today for full information. Patterson, Civil Service Expert, Box 4025, Rochester, N. Y.

WRITE articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyrighted book free. Press Syndicate, 553, St. Louis, Mo.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Wainwright, St. Louis.

INVENTORS desiring to secure patents should write for our book "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 620 F. Washington, D. C.

WANTED—Men—Railway Mail Clerks. $133 month. Write for particulars. Franklin Institute, Dept. D-20, Rochester, N. Y.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Slann Sign System, Bethune Ave. E., Detroit, Mich.

EARN $110 to $250 monthly, expenses paid as Railway Traffic Inspector. Position guaranteed after completion of 3 months' home study course or money refunded. Excellent opportunities. Write for Free Booklet CM-46, Stand. Business Training Inst., Buffalo, N. Y.

SILVERING Mirrors, French plate. Easily learned; immense profits. Plans free. Address, Wear Mirror Works, Excelsior Springs, Mo.

U. S. GOVERNMENT Jobs, $95-$192 month. Men—women. Steady. Many open. List free. Write immediately. Franklin Institute, Dept. D-20, Rochester, N. Y.

ALL Men Women, Boys, Girls, 17 to 65, willing to accept Government Positions $117-$250, traveling or stationary, write Mr. Ozment, 101, St. Louis, Mo., immediately.

LOCOMOTIVE Firemen for railroads nearest their homes—everywhere; beginners $150-$200 monthly. Railway Association, Desk M1, Brooklyn, N. Y.

EARN $25-$75 Weekly Writing Nu-Way Showcards. Previous experience unnecessary. Complete outfit furnished. Dept. 30, National Studios, 6121 Dorchester, Chicago.

START Silvering Mirrors, Headlights, Tableware. Replate stoves, jewelry. Plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

BOYS—Men, Become automobile experts. $35.00 week. Learn while earning. Write. Franklin Institute, Dept. D-401, Rochester, N. Y.

BE a Broker—own your business, no experience required. Write for information. George Grigoleit, 20 East Jackson, Chicago.

BE a Finger Print Expert. Demand increasing. Write for special free offer. American Finger Print System, 1[illegible] Broadway, New York.

$5 TO $15 daily easy—Introducing New Style Guaranteed Hosiery. Must wear or replaced free. No capital or experience required. Just show samples, write orders. Your pay in advance. We deliver and collect. Elegant outfit furnished all colors—grades including silks, wool, heathers. Mac-O-Chee Mills Company, Desk 26012, Cincinnati, Ohio.

GOVERNMENT Wants Railway Mail Clerks, $133 month. List positions open—free. Write today. Franklin Institute, Dept. D-20, Rochester, N. Y.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

EXPERIENCED Pattern Maker, Pittsburgh Lumber Company, Braemer, Tenn.

GOVERNMENT positions, $1,400-$2,300 yearly. Many openings. 36-page information booklet free. Chicago Civil Service College, A41, Kesner Building, Chicago.

$133-$192 MONTHLY, Railway Postal Clerks. Sample questions, list positions, free. Chicago Civil Service College, A-51, Kesner Building, Chicago.

EARN $10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decie Laboratories, 1133 Broadway, New York.

MEN Wanted Learn Automobile and Tractor Business, in eight weeks. Make $75 to $200 per week. Tuition reasonable. No colored students. Ohio State Practical Motors School, X-5 Cincinnati, Ohio.

INFORMATION

COMPLETE, accurate, information on any subject $1. National Information Bureau, 1429X Milton St., S. E., Grand Rapids, Mich.

MAILING LISTS

WE sell accurate names farmers, mail order buyers, housewives, $7.00 thousand. Mention State. Martineck Company, Corona, N. Y.

NEW names and addresses. Guaranteed Correct. J. H. Benson, Thorp, Wis.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS, all standard makes, $10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Typewriter Exchange, 320 West Goethe Street, Chicago.

UNDERWOOD Typewriters at far less than manufacturers' price; rebuilt, all worn parts replaced, guaranteed good as new. Cash. Installment payments. Write for Catalog 1519. Shipman-Ward Mfg. Co., estab. 1892. Montrose and Ravenswood Ave., Chicago, Ill.

SIMPLEX Typewriters $5.00. Remingtons $8.00. Smith Premier, $9.00. Demeo, Miantonomi Court, Providence, R. I.

TYPEWRITERS—All makes rebuilt, reconstructed and guaranteed ten years, $15.00 up, shipped privilege 30 days' trial. Get our prices and agents' proposition. Typewriter Co., 2316 University Ave., New York City.

TYPEWRITERS All Makes. Save one-half. Thoroughly rebuilt in our factory by the famous "Young Process." Fully guaranteed. Free trial. We handle all standard makes. Cash or sold on easy terms. Write for Catalog. Young Typewriter Co., Dept. 502A, Chicago, Ill.

OLIVER Typewriter, L. C. Smith and other makes; also fine binoculars to exchange for shotguns, Graflex cameras and Microscopes. National Camera Exchange, 7th and Marquette, Minneapolis, Minn.

ADDING MACHINES

FREE Trial. Marvelous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals $350.00 machine. Price only $15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalog and free trial offer. Lightning Calculator Co., Dept. E, Grand Rapids, Mich.

NEW $3.50 Automatic Adding Machine. Adds, Subtracts, Multiplies. Absolutely accurate. Capacity $999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates Mistakes. Saves Time. Postpaid $3.50. Bassett Co., 1458-B, Hollywood Ave., Chicago.

DUPLICATORS AND DEVICES

"MODERN" Duplicators save Time, Labor, and Money. Gets business. Reproduces Typewritten or Penned Letters, Drawings, Lessons, Music, Menus, Bids, Notices, Specifications, Maps or anything in one or more colors. Prints Two per minute. Special Sale On. 30 Days' Free Trial. $2.25 up. Booklet Free. J. E. Durkin-Reeves Co., Pittsburgh, Pa.

YOU can make 50 to 100 copies of a letter, notice, etc., at a cost of three cents on a Heyer Quality Duplicator. Write for free trial offer. The Heyer Duplicator Co., 14 S. Wells St., Chicago, Ill.

STENCIL Duplicating Outfit for Hand Use. $3.00. On Approval. Prints Typewriting—Handwriting. Primos Specialty Co., 3-M, Primos, Pa.

PRINTING, ENGRAVING AND MULTIGRAPHING

EMBOSSED Stationery, business or personal. Samples for stamps. Daniels Co., Pittston, Pa.

250 BOND Letterheads or Envelopes $1.50. Geyer Printery, Box 886A, Dayton, Ohio.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

JOB Printing, All Kinds—Cards to Catalogues. Quality work. Smith-Roberts Printing Co., Watseka, Ill.

500 GUMMED Labels. Name and Address, 30c. Eastern Label Co., Clintonville, Conn.

QUALITY Printing! Reasonable Prices! Tell us your wants and let us quote our Money-Saving prices. Best Work. We print anything. Ernest Fantus, 525 South Dearborn Street, Chicago.

GILT lettered Advertising-Pencils for you. Buy direct; save entire middleman's profit. Samples free (no agents). Address S. Musial & Co., 10-12 Lincoln St., Yonkers, N. Y.

PRE-USED Printing Presses. Type and supplies. List for stamp. Popular Bargains. Richland, Pa.

500 IMITATION Typewritten Letters $4.10, with printed heading. Bargains in Envelopes, Letterheads, etc. Prompt service. Samples and Price List. William Carlson, 8743 Essex Avenue, Chicago, Ill.

GUMMED Labels, Advertising Stickers. Samples Free. Lars Grindem, Goodell, Iowa.

OUR Art Blotters will help your business. Send for samples and prices. Lorraine Press, Beverly, Mass.

1,000 HAMMERMILL letterheads, envelopes, $3.25; 250, $1.25 postpaid. Samples Free. Troib Press, 98 Providence, Worcester, Mass.

WE print everything. Stationery, Booklets, Catalogs, Circulars, Samples. Commercial Press, Batavia, Ohio.

RUBBER Stamps, Gummed Labels. Lists free to offices, factories, stores, canvassers. McPherson Stamp Works, Middletown, Conn.

250 LETTERHEADS, 250 white envelopes, printed and mailed, $3.00. Samples printing free. Sunco, Mohawk, N. Y.

FREE Card Case with your name printed in gold on case with calling card order. 20 cards, 25c. 100, 50c. Samples free. Mail Order Prtg. Co., 2510A S. Twelfth, St. Louis.

225 BOND letterheads, envelopes, billheads, cards, $1.25 each. Combination, $4.00. Economic Press, Leonia, N. J.

1,000 LETTERHEADS or Envelopes, $3.00. Sent Prepaid. Samples Free. Monitor Press, Morrisville, Pa.

1,000 HAMMERMILL envelopes or letterheads, $3.10. 1,000 Bond statements, billheads or envelopes, $2.60, postpaid. Model Printers, 809 North 5th St., Nashville, Tenn.

150 EACH, Letterheads and Envelopes. $1.50. Jacobus Service, Irvington, N. J.

POSTPAID—500 Envelopes, $2.50; 100, 75c. A. Sturm, Stratford, Wis.

FOR MEN

ARE you old at forty? See our advertisement on page 88 of this issue. The Electro Thermal Company, 2128 Main St., Steubenville, Ohio.

WEARING APPAREL

SAVE 50%. Buy Direct Men's Silk Neckties. Fine Christmas Assortment Now. Box of Six, $4.60. Send No Money. Satisfaction Guaranteed. Box 450, Madison Square Station, New York City.

FOR SMOKERS

CIGARS—Save 75%. Make your own—We teach you. Universal Cigar Co., 17 Library St., Grand Rapids, Mich.

RAZORS AND BLADES

BLADES, resharpened, one edge 2c; double 3c. New York Edge Co., Glen Cove, N. Y.

BETTER Shaving—Blades Resharpened 3c, any make. Standard Safety Razor Corporation, Pittsburgh.

BOATS AND LAUNCHES

ROWBOATS easily made. Blueprint list free. Weesho-Uco., West Market, Detroit, Mich.

BUILD yourself a 12 foot Rowboat. Plans in The Rudder July, 1923—price, 25 cents. The Rudder, 9 Murray Street, New York City.

ROWBOATS—easily made. Literature free. Weesho-Uco, West Market, Detroit.

FURS

YOUR raw furs made up into beautiful garments. Enormous savings. Catalog Free. Arthur Felber Fur Co., 25 N. Dearborn, Dept. P. M. 4, Chicago, Ill.

OPTICAL GOODS

SIX Power Binocular, $5.00. Famous Wollensak Blascope, pocket size, light weight, excellent optical quality, fine illumination, handsome, durable finish. Complete with case, only $5.25 postpaid. Money-back guarantee. Wollensak Optical Company, 17-19 Clinton Ave. N., Rochester, N. Y.

ONE 2½" 45 Power, Telescope, complete with Astronomical and Celestial eyepiece and suitable tripod. A bargain at $30. One Carl Zeiss Prism Telescope, 12-24 and 42 Power, complete with heavy leather carrying case and panoramic tripod, $137.50. One B. & L. Student Microscope, complete, $27.50. Send for Photograph. Defranne, Importers, 109 N. Dearborn St., Chicago, Ill.

ANTIQUES, WAR RELICS AND INDIAN GOODS

WAR Relics for Collectors; Relics from Europe's battlefields. Firearms, shells, medals, helmets, etc. Illustrated catalogue and sample War Photographs 25c. Lieut. Welsh, 2117 Regent Place, Brooklyn, N. Y.

INDIAN Baskets, Blankets, Wampum Mats Wholesale. Catalogue. Gilham, Kelseyville, Calif.

SEND 5c for list Coins, Indian Relics, Firearms. F. E. Ellis, Webster Groves, Mo.

RELICS from Europe's Battlefields. Firearms, helmets, medals, etc. Illustrated catalogue with sample War Photographs, 25c. Lieut. Welsh, 2117 Regent Pl., Brooklyn, N. Y.

FOR THE HOME

KEEP warm this winter. Save 20 to 50% on your coal bills. Eliminate smoke and deadly gases. Equip your heating plant with a Crown Fuel Saver and learn what winter comfort means. Over 10,000 satisfied users are getting steadier, cleaner heat. The Crown fits the feed door of any heating plant. Requires no attention. Works automatically. Pays for itself in coal saved. Write for details and free booklet. Crown, Dept. A, Richmond, Ind.

LOOMS—Only $9.90—Big money in weaving rugs, carpets, portieres, etc., at home, from rags and waste material. Weavers are rushed with orders. Send for free loom book, it tells all about the weaving business and our wonderful $9.90 and other looms. Union Loom Works, 480 Factory St., Boonville, N. Y.

THREE brand new kitchen necessities every home will appreciate. Special Xmas sale. Circular Free. Lumite Products Co., 409 Walnut, N. E., Canton, Ohio.

GRANDFATHER Clock works, $5.00. Build your own case; Instructions free; make good profits selling your friends. Clock works with chimes for old or new cases. Write for full particulars. Clock Co., Ruffner St., Philadelphia.

DIAMONDS, WATCHES AND JEWELRY

WATCHMAKERS: Earn highest wages. Understand adjusting thoroughly. Circular free. Write Walter Kleinlein, Publisher, Waltham, Mass.

PHONOGRAPHS AND RECORDS

TRADE your old phonograph records or player rolls on new ones. Stamp brings list. Fuller Exchange, Wichita, Kan.

SUPERIOR Equipment at lowest price for building fine phonographs. Superior Phonoparts Co., Erie, Pa.

BUILD Your Phonograph. Quality phonoparts. Quality Serenado motor and motors of other types. Electric Motors, tonearms, reproducers, amplifiers, case materials, accessories. Free blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Catalog mailed for ten cents. Hoosier Manufacturing & Supply Co., 313 Baldwin Block, Indianapolis, Ind.

BUILD Your Own Phonograph or Radio Set; catalogue for stamp. Dayton Phono. & Radio Store, 118 West Court Street, Dayton, Ohio.

BUILD your own phonographs. We can supply you with motors, tone arms and all accessories at wholesale prices. Write for catalogue AX. Pleasing Sound Phonograph Co., 204 East 113th St., New York, N. Y.

BUILD a genuine Choraleon phonograph and save over half. Big profit building and selling. We furnish motors, tone-arms, full instructions and all necessary parts. Send for catalog and free blueprint offer. Choraleon Phonograph & Radio Co., 1223 11th St., Elkhart, Ind.

BUILD your own Phonograph. We furnish everything. Write for catalog and free blueprint offer. American Phonograph Co., 3515 North Crawford, Chicago.

MUSIC AND MUSICAL INSTRUMENTS

"MUSIC Composed" to words. Bauer Bros. (formerly of Sousa's Band), Oshkosh, Wis.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

GENUINE Amber Violin varnish. 2 oz. $2.00. Perin, Rushville, Ind.

COMPLETE, easy self-instructors—Harmonica, Violin, Piano, Drum, Ocarina, Mandolin, Accordion, Saxophone 25c each. G. Elsea, Bowling Green, Ohio.

I WANT song poems. Casper Nathan, Garrick Theatre Building, Chicago.

CORNETISTS—Trombonists — Saxophonists—Clarinetists. Send for "Free Pointers No. 2." Name instrument. Virtuoso Music School, Concord, Mass. Formerly of Buffalo, N. Y.

DIRECT the band like John Philip Sousa. Play the Cornet like Herbert Clarke. Let me teach you how. Full particulars free. VanderCook's School, 1652 Warren Avenue, Chicago, Ill.

EASY way to play the harmonica or mouth organ, 25c. Mercatus Co., Box 1422, Indianapolis.

SAXOPHONISTS: Eby's Saxophone Method. 44 Divisions. 340 pages. Price, $4.00. Virtuoso Schools, Concord, Mass.

GENUINE Amber Violin varnish, 2 oz., $2.00. Perin, Rushville, Ind.

VIOLINS — Deep, Mellow, Soulful — on credit. Easy terms for wonderful instrument. Get details today. Gustav F. Henning, 2424 Gaylord St., Denver, Colo.

PATENT ATTORNEYS

PATENTS—Before disclosing an invention the inventor should write for our blank form "Record of Invention." This should be signed, witnessed and returned to us together with model or sketch and description of the invention and we will give our opinion as to its patentable nature Free. Our Three Books mailed Free to inventors. Our Illustrated Guide Book, "How to Obtain a Patent," contains full instructions regarding patents. "List of Patent Buyers" sent Free, contains unsolicited letters from manufacturers and others who are constantly writing us regarding the purchase or leasing of meritorious patents. Victor J. Evans & Co. 934 Ninth, Washington, D. C.

STORAGE battery and kindred inventions specialized by lawyer formerly engaged in battery manufacture. M. E. Jones, 569 Seventh, Washington, D. C.

HORACE L. WOODWARD, registered patent attorney and mechanical expert, Washington, D. C., renders quality service to inventors. Recommended by manufacturers. Advice free. Seventeen years' practice. Reasonable cost.

HERBERT JENNER, patent attorney and mechanical expert, 624 F Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

PATENT, trade-mark, copyright specialist. Free Duplex conception form. Personal service exclusively. M. E. Jones, Lawyer, 509 Seventh, Washington, D. C.

PATENTS promptly procured. Personal, careful and efficient service. Highest references. Moderate fees. Send sketch or model for actual search and advice. George P. Kimmel, Master of Patent Law, 54-O Loan and Trust Bldg., Washington, D. C.

"INVENTORS' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 15-P Park Row, New York.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Send model or drawing for preliminary examination. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

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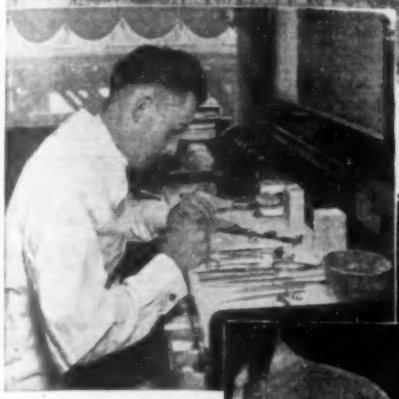

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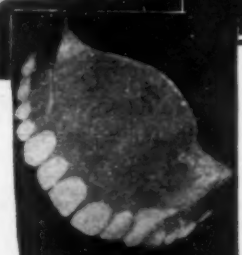

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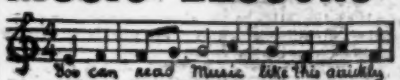

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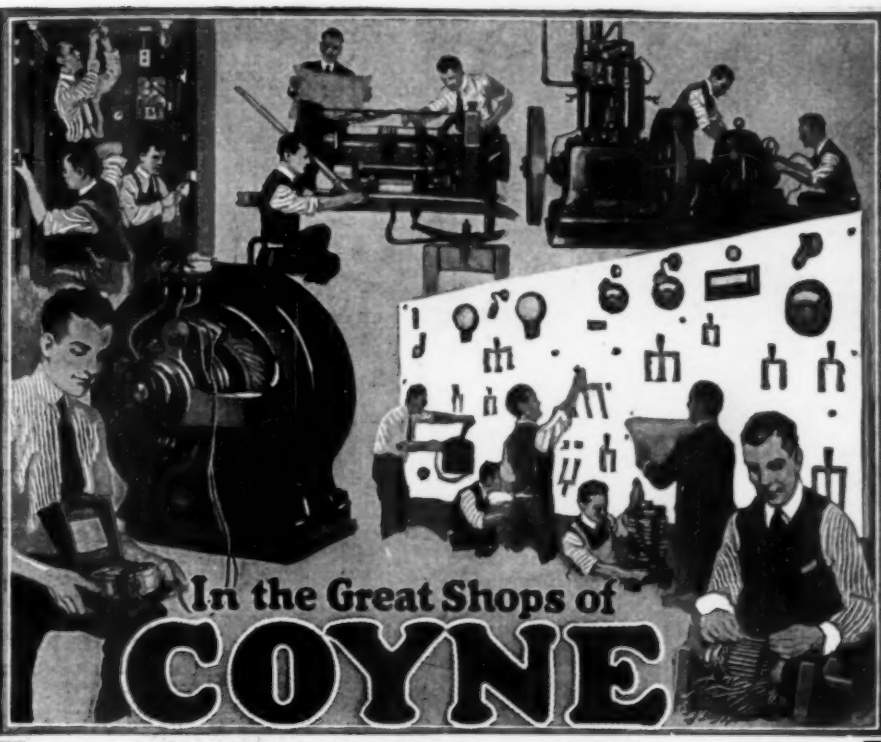

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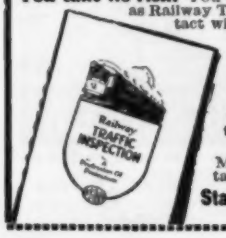

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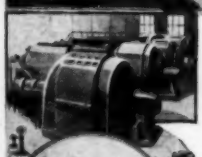

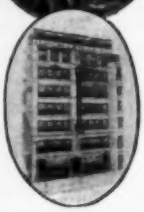

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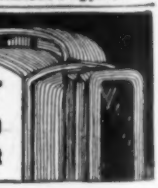

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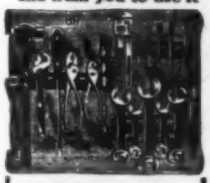

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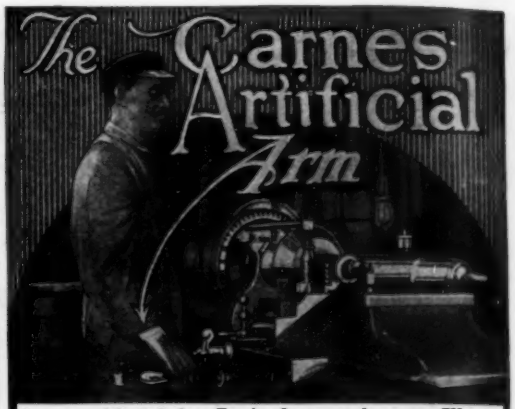

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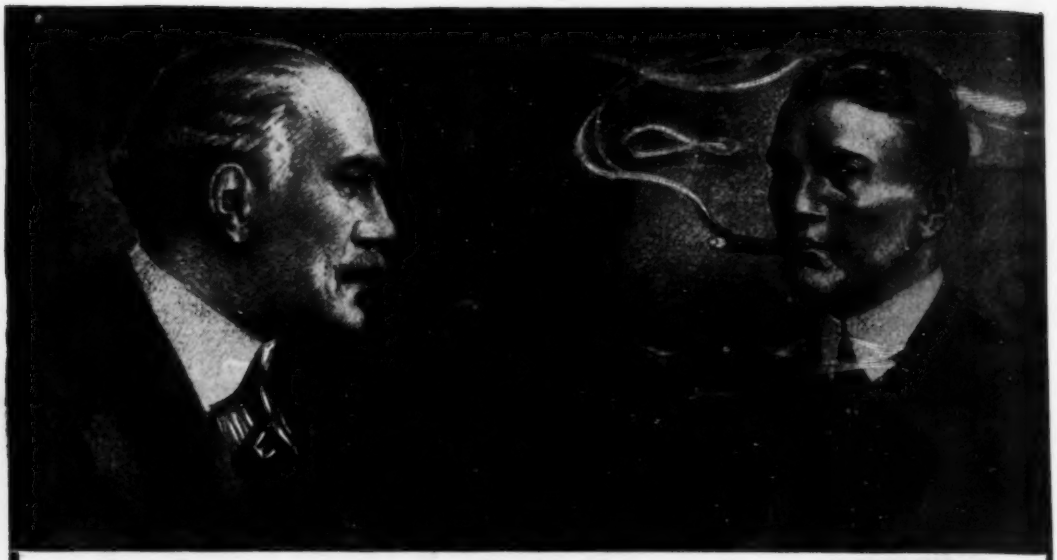

Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For **you** know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco **has** undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
and slight exertion makes you short of breath—
then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And YOU know that the use of tobacco in any form is an expensive, utterly useless habit. You know you ought to quit.

Tobacco Habit Banished

Let Us Help You

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—Tobacco Redeemer will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

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but

But I wriggled around and got a hold on him that I'd learned from the Farmer Burns School of Wrestling. The next second—KERFLOP, and I had Mister Ted Brown on the ground, tied up so he couldn't move and yelling for me to quit. Gee, Tom, wrestling has it all over boxing for defending yourself. Why it's a cinch to handle a fellow half as big again as you are *if you know the secret holds*. If I were you I'd write to Burns School for their free book about wrestling. See you next week. So long—FRED.

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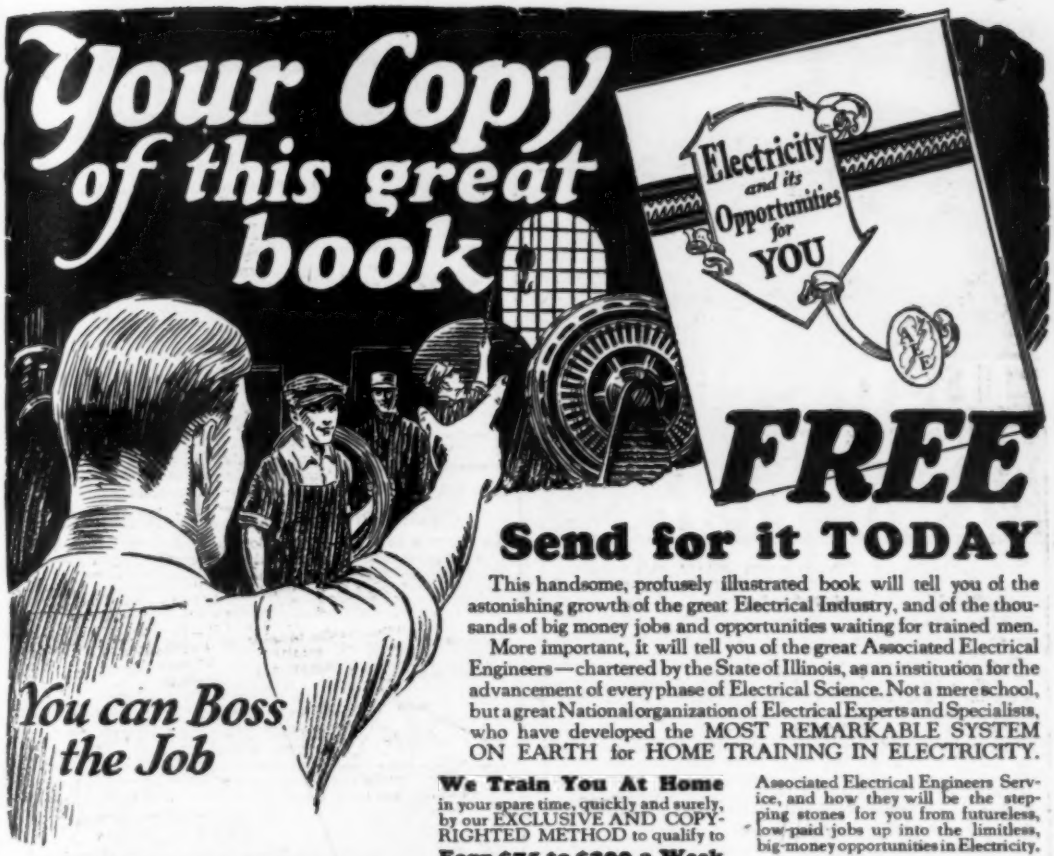

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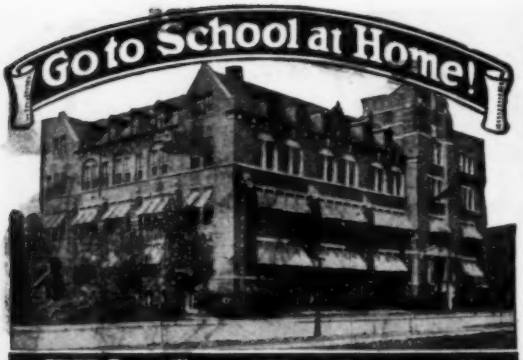

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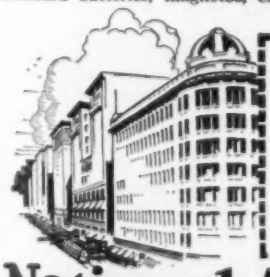

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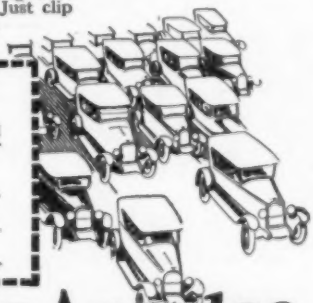

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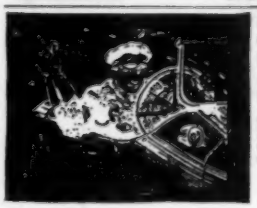

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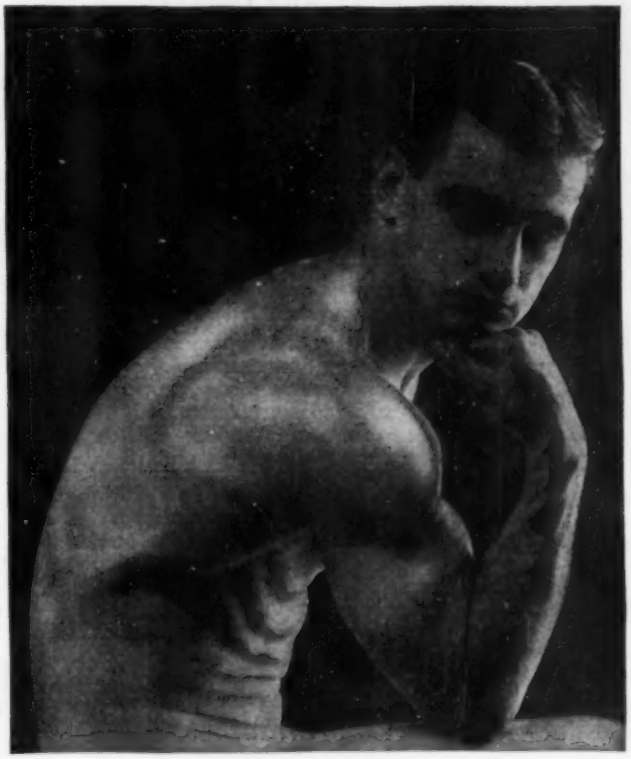
is the way you feel. Health means more than having just enough energy to get through your daily work. Real health means the possession of considerable muscular strength combined with great powers of endurance. It means that your internal organs are in first-class working order. It means that immunity from temporary sickness and chronic disease which shortens life.

The next most important thing **is the way you look.** Your personal appearance counts for a lot in these times. It is nice to look well in a bathing suit; but it is far more important to be able to create an impression when in your street clothes. To have people exclaim "My, what a *finely built* chap!" after one glance at the broad shoulders, deep chest, trim waist and beautiful proportions which are noticeable even when you are fully dressed.

Your aim in training should be, **not health alone, not appearance alone, not strength alone,** but that combination of all three which is the surest sign of real vigor.



CHARLES MACMAHON

I am looking for the man who wants to save time. The man who knows that he needs to improve his physical make-up, who has very little time to exercise and who **must have results.**

I have an entirely new training method which contains a time-saving element found in no other course of training. The principal muscles are exercised in groups. There are but few exercises in each lesson and after you have mastered these exercises, you drop them and substitute the more advanced exercises in the next lesson. Under my tuition you never have to practice more than a few minutes a day. The effect is so sure and rapid that:

1st. Weak beginners, who can't even chin themselves with both arms, soon find that they can easily chin the bar with one arm.

2nd. The stout beginners who cannot even reach their ankles can soon learn to bend over and put the palm of their hands on the ground, without bending their knees (and incidentally reducing their waist girth by 8 or 10 inches).

3rd. That scrawny beginners soon find themselves gaining weight and shapeliness as a result of their increased digestive powers.

4th. That undeveloped beginners soon find themselves taking pride in their unusually large and clean-cut muscles.

5th. That non-athletic beginners soon find that they are in possession of the speed and strength that makes them winners in sports and games.

I suggest that you send 10c (stamps or coin) and obtain one of my art booklets. The name of the book is

The Royal Road to Health and Strength

It explains *how* and *why* my pupils make such tremendous improvement in such a short time.

CHARLES MACMAHON

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Cartoonists Trained by W. L. EVANS

MAKE MONEY

SOME of the **cleverest cartoonists** in America today are **former students.** They studied during their spare time and are now making **good money. Cartoonist Evans'** system of teaching is so **simple, easy and practical** that it is not hard to learn to draw **originals.** The school has a **long established reputation** and is recommended by well-known cartoonists because they know the students are handled right.

If you like to draw, send us a sample of your work, either a copy or an original. You may have more ability than you think. We will send you a **portfolio of cartoons** and **full details** about the school.

The Course is NOT EXPENSIVE

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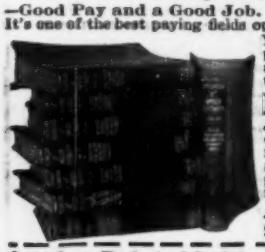
—Good Pay and a Good Job. You can succeed in electricity. It's one of the best paying fields open to young men who know.



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A garage or repair manager!

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Learn garage and repair shop system. Learn expense and overhead.
Learn how much jobs cost and why—fit yourself to conduct your own business.

IF you are not earning at least $50.00 a week—with $75.00 and your own business in sight—this message is intended for you! There is an overwhelming demand for *big* auto men, the kind of a man who knows the financial as well as the mechanical end of his trade. To those men go the managerships. They are the men who eventually establish themselves in a business of their own. They are the men, who through their complete knowledge of system and costs can successfully compete with garages that are run on a guesswork basis.

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There was a time when a man had to serve years as an apprentice in order to learn a business. He usually started by "sweeping out." But those days are gone. Now, all the information the apprentice got in years you can get in a few weeks, right here in New York. For 15 years Stewart instructors have been making automobile men. For 15 years the Stewart School has been recognized as the leading school by automobile companies all over the East.

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Decide Now

Make up your mind now to investigate the opportunities in the automobile business. *Learn about the Business Course offer!* Send the blank below and get our big FREE BOOK. You will be under no obligations. The book gives just the facts and figures you need. It shows just what chance you have in the automobile business and just how you can get in after 10 weeks in New York.

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Please send me your free book that describes your school and the opportunities in the Automobile Business. I am under no obligation.

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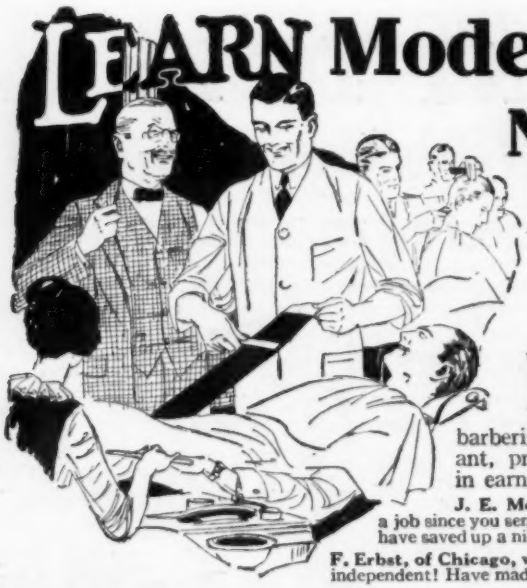

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What Moler System Means to You

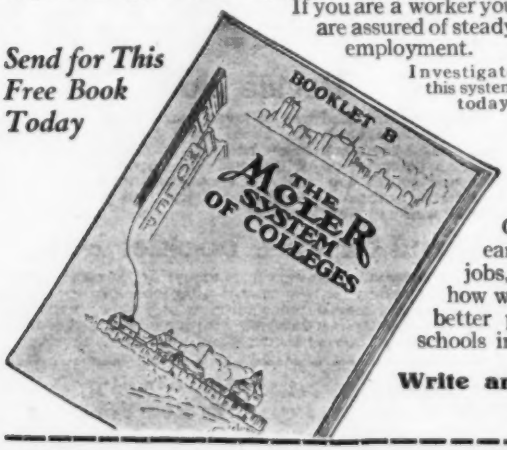
Our national advertising educates the public to the safety, comfort and economy of Moler post graduate work. It makes you the sought-after barber in your locality. It keeps your chairs filled and turns profits into your pocket. You as graduate are a part of a national institution which assures steady, profitable business. Through no other method can you get this.

We Equip Your Shop on Easy Terms

If you own your own shop your success is assured. If you are a worker you are assured of steady employment.

Investigate this system today.

Send for This Free Book Today



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You want to get ahead—you want to make more money—big money. Our short, practical course gives you a complete training in modern barbering, including the electric hair cutter, the mechanical massage and scientific treatments. It also affords a study, if one desires, on hair and skin—it makes you an expert and expert barbers are always in demand.

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Remember that you get my personal attention all through your full course of 52 lessons. Every letter you get will be signed by me—Professor Harry Six—because it's my job to see that you learn to play right away. You will play right off with my method—next week you'll be in more advanced pieces—and in a short time you'll be playing Bee's Knees, Crying for You, You've Got to See Mama Every Night, and all the popular airs.

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With each of the 52 lessons we give absolutely free a popular song, so you will know all the favorites.

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For a limited time only to students who enroll in our conservatory we will give absolutely free $18.00 full size professional tenor banjo. This is a big offer for people who love music and who have never been able to produce it. Send us your name and address on a post card for circular giving full particulars on just how Professor Six has been able to teach thousands to play—and how he can teach you so you will play from the first lesson on. Send the post card today, as Professor Six can give his personal attention to a limited number only, and **you want him.**

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CLIP the coupon at the bottom of this page and get your free copy of this fascinating book—a book that will quickly prove to you that there is big money for you in Radio, and *show you just how to get it.*

Radio is the big, new money-making field for alert, wide-awake men who are keen for *business betterment* and *bigger bank accounts.*

In the entire history of industry, there probably never has been a business development which compares with that of Radio. Within an amazingly short time it has jumped into the ranks of the world's largest and most profitable fields of endeavor.

The marvelously rapid expansion of Radio has opened up a multitude of avenues for personal advancement and profit-making. It has created opportunities never dreamed of in other fields. It offers you *big money—an interesting occupation — quick advancement* — a golden future in the world's fastest growing industry.

Send for this free book at once! Investigate immediately! Don't rely on anyone else! Learn for yourself about the big opportunities that exist for you in Radio!

This FREE Book

Points the Way

What Big Men Say

Big men—men of vision—men of accomplishment—are quick to see the wonderful opportunities that exist in Radio for the active, aspiring man of today.

Austin C. Lescarboura, Managing Editor of *The Scientific American*, says: "Radio is distinctly the ambitious man's field, because he has an opportunity to mould it to his ideas. He can play an important role in Radio development. When I look over the unparalleled advance of a brief decade and a half, I hesitate to predict what the next decade may bring forth in Radio development. But I am positive of one thing and that is the REAL OPPORTUNITIES THAT EXIST FOR THE AMBITIOUS MAN ARE IN THE RADIO FIELD."

Ex-Postmaster General, Will Hays said: "Perhaps the biggest part in the future of the Postal Service will be played by Radio."

H. S. Gernsback, Editor *Radio News*, says: "There is perhaps no art that has before it so glorious a future as Radio. More things are being accomplished by Radio today than the boldest thinker could have imagined thirty years ago. Radio belongs to the present rising generation. There are so many fields that Radio touches that it is almost impossible to cite them all.

But there is no room here to go on quoting the opinions of the leaders in thought and action, as to the marvelous opportunities that exist for you in Radio. So, send for the free book which tells—in type and pictures—the whole story of your big chance to attain *a more interesting vocation—a bigger financial income—a happier business life.*

What Others Are Doing

Men who are jumping into Radio today are climbing high on the Ladder of Achievement.

Edward J. Nally, who was a telegraph operator, has risen to the presidency of the largest Radio Corporation in the world.

William Dubilier got in on the ground floor of Radio and is today worth over a million dollars.

Edward H. Armstrong began experimenting as a Radio amateur, and recently sold some of his patents for several hundred thousand dollars.

David Sarnoff started at the foot of the ladder, but is now General Manager of the largest Radio company in America.

Elmer E. Bucher began at the bottom but is already recognized as an authority on Radio and its applications, through the many text-books he has written on the science.

And there is Grebe, Boucheron, Pannill, Finch and a myriad of others we could tell you about if we had more room on this page. But you can read about them all—and other successes—*and your own opportunity for success*—in our free book, which is now yours for the asking.

Get This Book Now

Right now is the time for you to find out all about the many big prizes that Radio is ready to throw into your lap.

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So, clip and mail the coupon now! For here is a new thing—a new business—which is growing so fast it can hardly keep up with itself—a business that offers you the biggest chance you ever had to *make good* and *win out in a big way.*

Do not neglect it! Act now—now while the Radio industry is getting ready to supplant every other means of communication—now while the big opportunities exist for clear-brained men of action.

Get into Radio now—on its upward swing—and it will lift you to higher levels of power and accomplishment than you ever before thought possible.

National Radio Institute, Dept. 15-M, Washington, D. C.

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You may send me—without cost or obligation—a copy of your free book "Your Opportunity in Radio."

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Men Wanted—Mechanically Inclined

"I am for Men, not wage slaves"

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YOU want to make more money. You want to do the work you like. You hope to be independent, to be your own boss. Perhaps you want to travel and see the world. You want to get out of the rut. You want a job with a real future. Then learn about the opportunities that exist everywhere, at home, in your own town, on rural routes, state highways, cities, etc., offering every choice of climate and living conditions, of starting your own business as a garage or tire-service shop. Auto mechanics are needed everywhere, and men who want to travel and see the world but don't want the responsibility of owning their own place find jobs at $50 a week and up quicker than any other line of work.

Over sixty thousand men have proved this to be true, and over twenty thousand are running their own business. These are the interesting figures from the records of this famous and successful trade school, the Million Dollar Sweeney Auto School at Kansas City.

I Started With $76.65

I started my own business 15 years ago. I had nothing but a family to support; lots of nerve; a determination to make good; two trained mechanical hands, and $76.65 in cash. Today I own the Million Dollar Sweeney School. I made a success by teaching others to be successful. I am teaching the most practical, most profitable, easiest learned trade in the world. I am teaching white-collar boys from cities who want to get into overalls, and boys from the farm who want the bigger opportunities and advantages of city life. I am teaching coal miners, factory employees, unskilled laborers of all kinds, men who want to quit being wage slaves, whose jobs a strike or bad business or employer's whim can terminate without warning. Who want a chance to be independent, make real money, and own their own business. I refer you to sixty thousand men who found the way to success by sending for my catalog.

How to Be Sure of a Steady Job

Today LABOR is getting high wages. There is no lack of employment. But will the young man realize that history repeats itself? That to be safe he must have a skilled OCCUPATION in a permanent industry? That to be safe he should be independent? He should plan to own his own business. Today any strong man willing to work can get good wages. Perhaps he does not realize that a JOB BY THE WEEK is a poor job, no matter what the pay is.

I want to urge ambitious men to CHOOSE WORK SHIRTS instead of SILK SHIRTS.

It is true that to LEARN THE AUTOMOBILE BUSINESS means you must make some sacrifice. You must spend some weeks and several hundred dollars in LEARNING. In being trained. During this period it looks like the fellow who is getting eight dollars a day in common labor job requiring no skill, training responsibility has the best of it. But what of the DAYS TO COME?

The Sweeney Trained men are ready to HOLD GOOD PERMANENT JOBS. To be partner or owner in a garage. To be independent. To be in business for himself. He is not working in a factory that may close down overnight, on a railroad where a strike may put him out of business, in a coal mine where labor troubles may send him to the bread line. He has CAPITAL in his head and hands.

Be Your Own Boss

Of the 60,000 Sweeney Graduates, I estimate that 20,000 of them own garages, tire shops, vulcanizing and service shops. It is easy to start in business for yourself. Then you don't have to bow down to some employer and do work you don't like. I say work for yourself, then you are not bothered by strikes and lockouts or factories closing down. OWN YOUR OWN BUSINESS. Work for yourself with enthusiasm, not drudgery. It's the yearning of every young man to BE HIS OWN BOSS, and Sweeney makes it possible.

Sweeney trains men in 8 weeks in the Auto and Tractor Business, and you don't need previous experience.

The man who writes for my CATALOG has taken the first step towards his OWN BUSINESS. Towards Independence and Prosperity. It's just your own lack of energy and enterprise that's holding you back! Trust yourself! I will show you HOW EASY it is to be a man of standing and importance in your town.

A Billion Dollar Business

The AUTOMOBILE BUSINESS is America's greatest industry. It employs twice the capital of the National Banks in the United States. In 1922 people paid ONE BILLION FOUR HUNDRED AND NINETY MILLION DOLLARS FOR TIRES, and over SEVEN HUNDRED MILLION DOLLARS for parts and accessories. Yet this great business is just beginning. In ten years there will be over 23 million

Own Your Business-Travel-Be Indepen-

You Like—Here's How to Succeed!

pleasure cars alone. That is about one for every family. Trained mechanics are in demand. Hundreds of thousands of men are needed not only as mechanics, but as salesmen, garage owners, tire repairers, dealers, demonstrators, chauffeurs, etc.

The smart man will QUIT his job and learn a SURE TRADE. He will BUILD A BUSINESS OF HIS OWN. He will be independent and not at the mercy of strikes, depressions, and circumstances beyond his control.

There was never a time when a man should consider his future and plan to put himself on a sure foundation more opportune than TODAY. Don't be a wage slave.

In thousands of localities there are opportunities for garages, repair shops, tire shops, sales agencies. Radio offers similar independent opportunities. Own your own shop. Stand on your own feet! How can you get into this great business?

What Others Have Done

There are opportunities everywhere. Other fellows with money are often looking for trained men to handle the mechanical end as partners.

Look at Clayton Eden's nice garage at Ainsworth, La. Clayton says: "We operate the leading garage. Have all the business we can do. Also handle Hudson, Essex, and Buick cars. Owe my present success to the wonderful training received at the Sweeney School."

Roy Atkinson sent me this letter from Everett, Mo. "Worked on a farm," says Roy. "At nineteen had only $14.00. Got father to send me to the Sweeney School. Three days after I came home I fixed a neighbor's Ford car. That was my start. Today this garage is worth $4,785.00. My business takes three men to handle. I never worked in any other garage. I used my Sweeney training. If you want to get that start, do as I did and go to the Sweeney School."

Look at John Boyer's garage at Milford, Illinois. John says: "Having a good business; busy all the time."

From far off Australia, S. A. Noller writes business is fine.

What these boys have done YOU can do. If you like mechanics, write me today for my big free catalog. Mail the Coupon today or post card will do.

What Is the Sweeney System?

The Sweeney System is the practical way—the only way to learn if you want to get into the Automobile business at the least possible expense of time and money.

It is easy—requires no previous education—no books—only 8 weeks' work. Our way of training is interesting in the extreme because it is so practical; no guess work to it. Just like a boy told me this morning. He said: "I really ought to go home and help the old man with his crop, but I never had so much fun and worked as hard and learned more in my life." He said he could spend six months here and every day learn something new.

For Fathers and Mothers

I am the father of ten children. I surround the men in my school with the same good moral atmosphere and provide them the same opportunity and square deal I would like other people to give my children. I say to you, parents, help your children. Give the boy a chance. Investigate yourself the real opportunities for **Success** and Independence in the Auto Business. Don't make him a farmer because you have been one, or a wage slave because you may have been a worker for others. Give him a chance. Think of the Texas mother who saved up the butter and egg money, sent her boy here, and now sees him a successful business man. Or the Missouri father who helped his boy come here, and now is glad to be a partner in that boy's $5,000.00 garage.

Get This Free Catalog

If interested in bettering your condition, simply send name today and get a free copy of my new illustrated 64-page catalog and a free copy of the interesting Sweeney News; also many pictures showing men at work and play in this world-famous school. I will also tell you about a special new offer I am making, and some interesting opportunities in this line of work. There is no cost, no obligation, no one will call on you, or bother you. No colored students accepted. Just send name today to

E. J. SWEENEY, President

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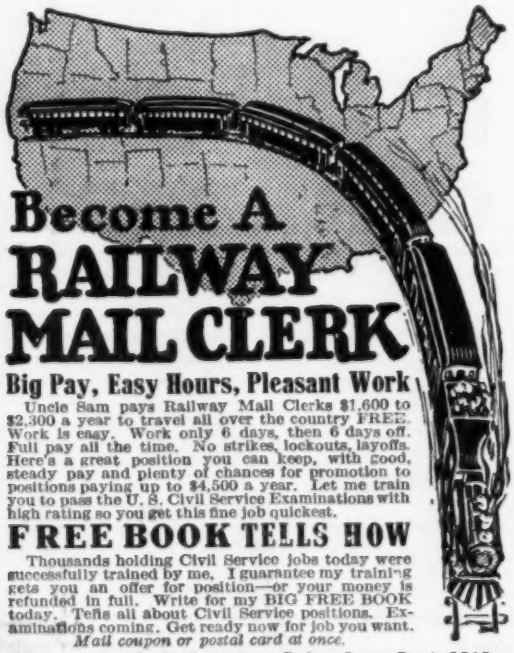

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This heavy, double-breasted, all-wool overcoat will give you dandy service. It is beautifully made of pure all-wool material in a warm, deep, rich cinnamon brown. The back of the material is an attractive plaid in harmonizing colors. Partly lined in high grade, durable material. Large collars, semi-raglan sleeves, full belt, roomy patch pockets and bound seam. Length 44 to 47 inches. Sizes 34 to 46 inches chest measure. Give chest measure taken over vest. Order by number 4689.

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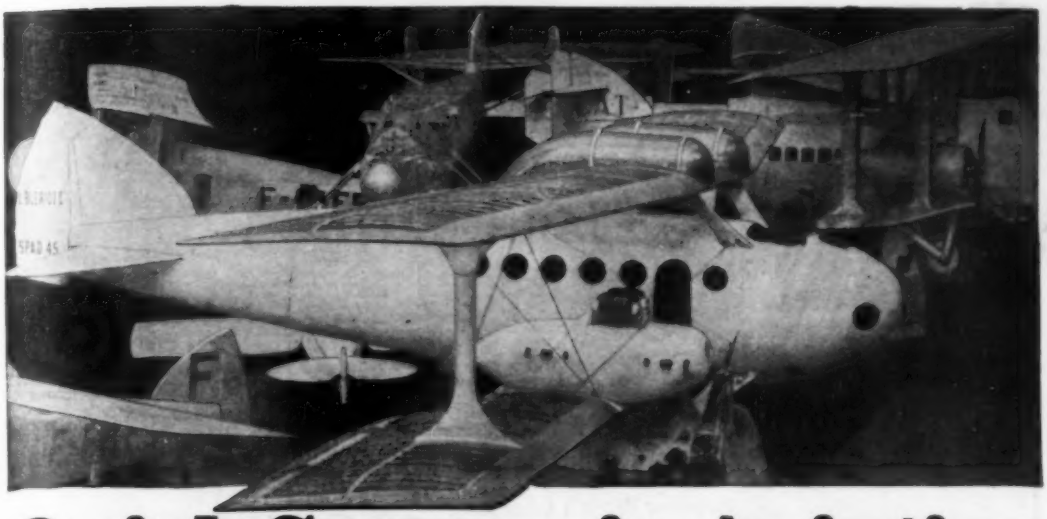

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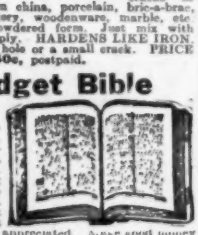

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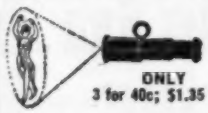

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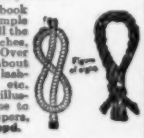

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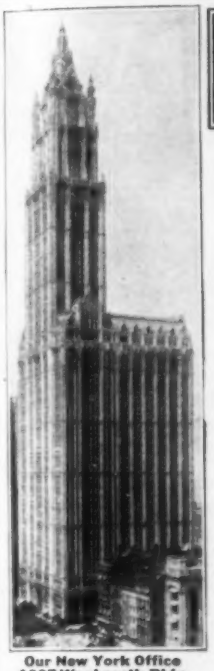
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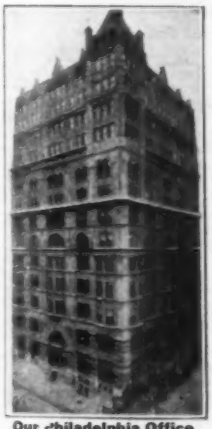
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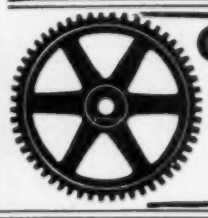

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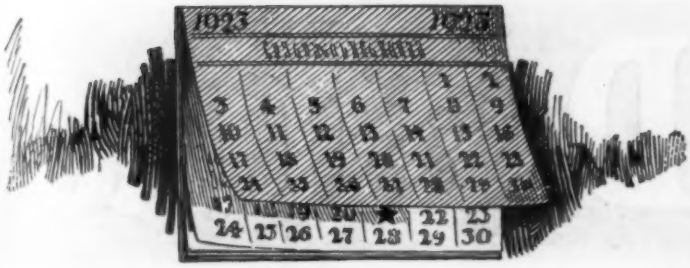

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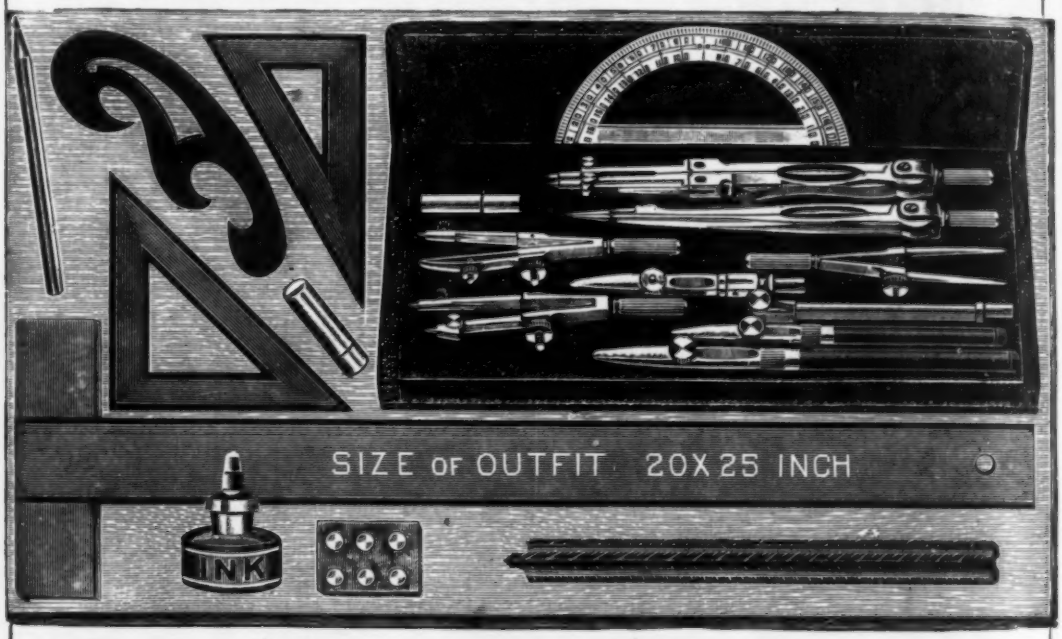

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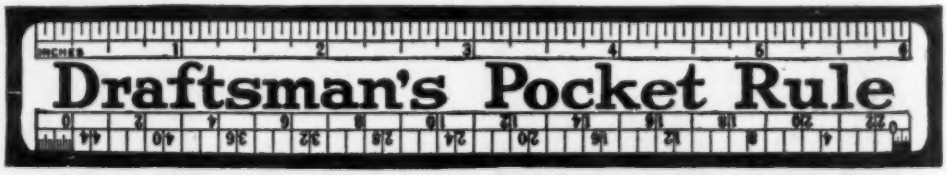

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To everyone who writes now for the offers which I am making, I will send this Ivorine pocket rule free. All you need to tell me is your age and that you are interested in becoming a draftsman. I want you to have this constant reminder of the great future which will be in store for you if you become a draftsman.

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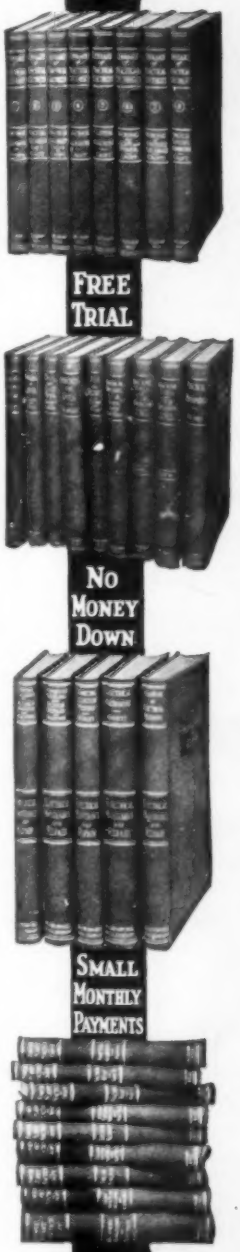

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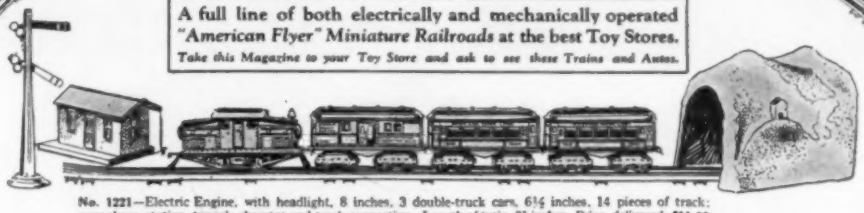

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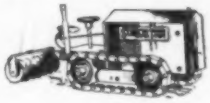

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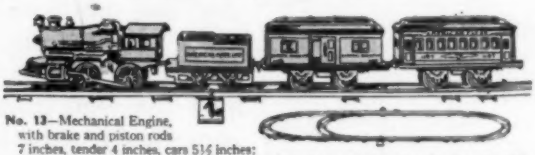

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Could the telephone directory in the hands of each subscriber be revised from hour to hour, there would be no need for the information operator. But the directory cannot at one time list all subscribers. Even during its printing and binding, thousands of changes take place in the telephone community. New subscribers are added to the list. Old ones move their places of business or of residence.

Though their names are not listed on the directory, these subscribers must be connected by the highways of speech with all others in the community. To supplement the printed page, there must be guides at the crossroads of conversation.

Such are the information operators, selected for their task because of quickness and accuracy, courtesy and intelligence. At their desks, connected with the switchboards in central offices, they relieve the regular operators from answering thousands of questions about telephone numbers that would otherwise impede the rendering of service. If they are asked for numbers already in the directory, service is retarded.

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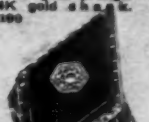

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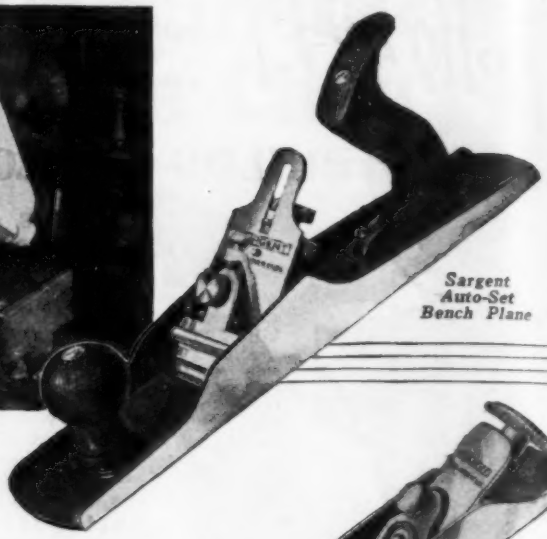

Sargent Auto-Set Bench Plane

Sargent Steel Block Plane

A plane that measures up to your best workmanship

Sargent Steel Pocket Plane

ABILITY to make things—and TOOLS, good tools, with which to make them! There's the unbeatable combination!

This Sargent Auto-Set Bench Plane is a *good,* fleet running mate for you. It is as light and keen as an all 'round plane could possibly be and is fully capable of meeting every demand you might make of it.

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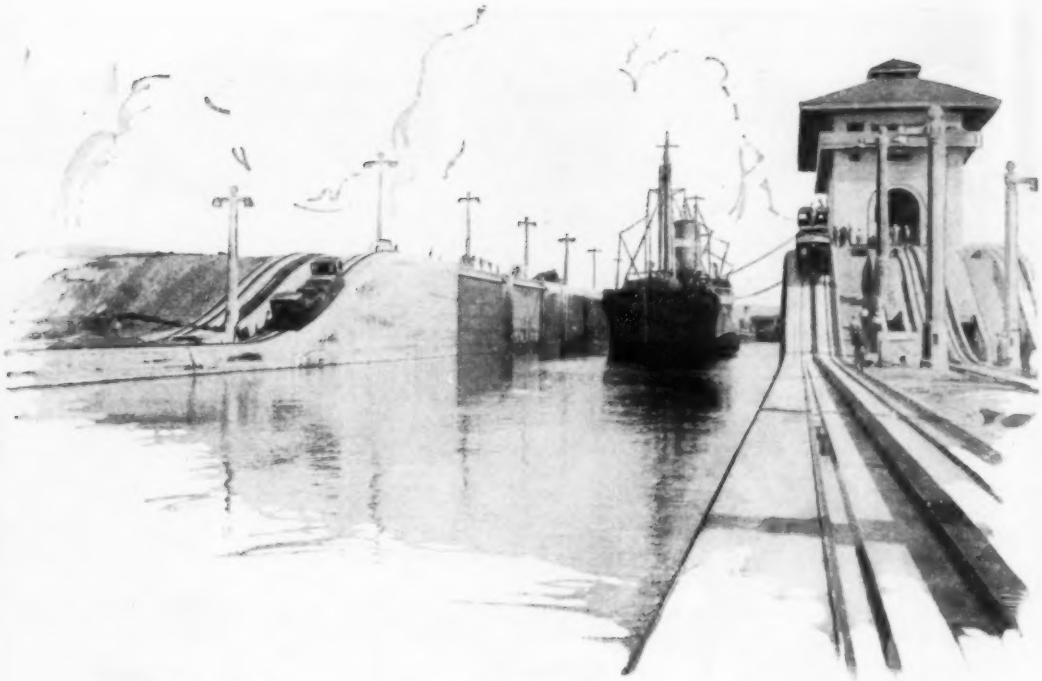

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A greater economy because of the 1,500 General Electric motors which do its work—pulling the ships through, pumping water, opening and closing the locks—all at such a little cost.

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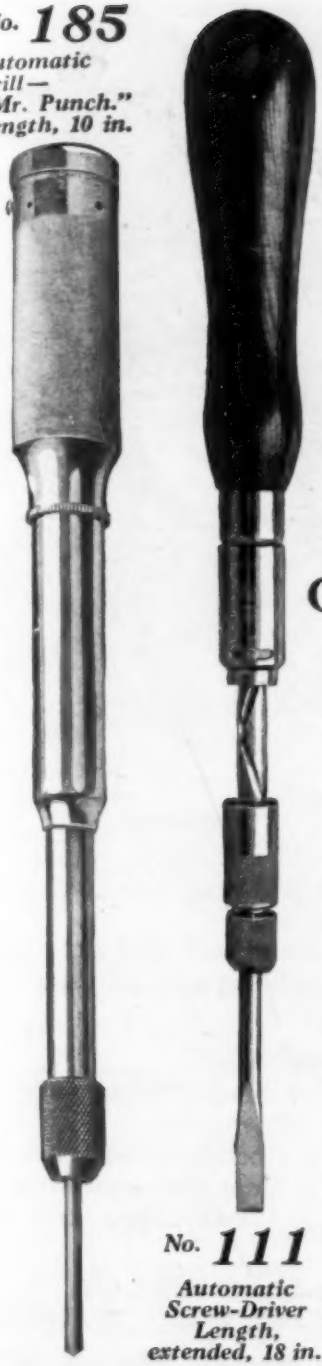
GENERAL ELECTRIC

No. **185**
Automatic Drill— "Mr. Punch." Length, 10 in.



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These Goodell-Pratt Christmas Gifts are sold by hardware stores everywhere. If your dealer hasn't them, order direct from us. Price of each tool is $2.50.

No. **111**
Automatic Screw-Driver Length, extended, 18 in.

Mr. Punch says: "Do your Christmas Shopping at the hardware stores."

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GREENFIELD, MASS., U. S. A.

Toolsmiths

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1500 GOOD TOOLS

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Write us a post card—
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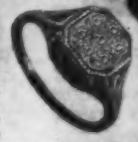

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Terms, $1 with coupon, $2.10 monthly.
Total price, $13.65

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Buy the Elmer Richards way. You can always be well dressed and pay in small monthly sums, so small you will never miss the expense. Money back if not satisfied. No charge for credit. Don't miss this bargain. Supply limited at this special bargain price.

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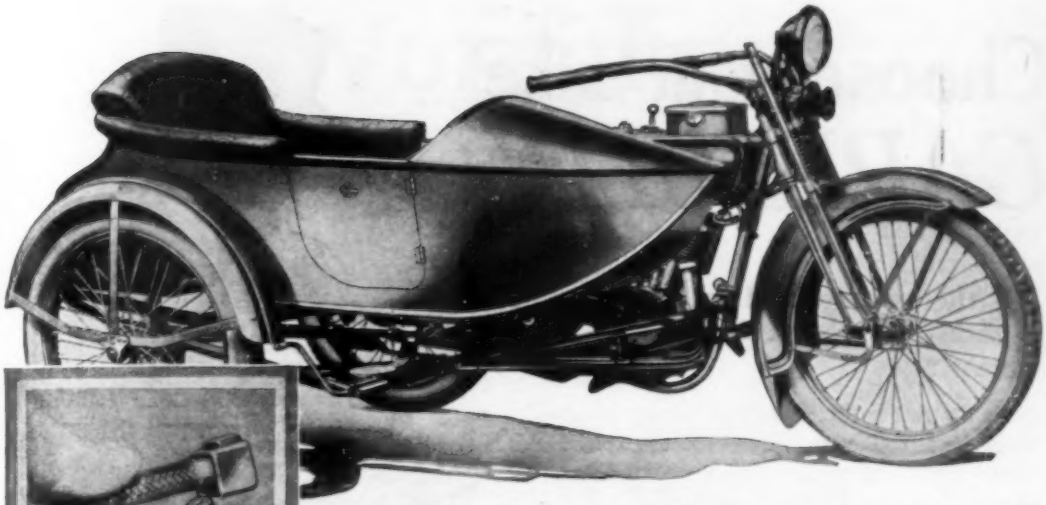
Write for our Monthly Bulletin of men's, women's and children's clothing and shoes.



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ALEMITE lubrication—first on any motorcycle—makes the "weekly once-over" of the 1924 Harley-Davidson a clean, easy, five minutes job. This handy, thorough system is just another refinement—more evidence of the engineering that keeps the Harley-Davidson, year after year, the finest motorcycle ever built.

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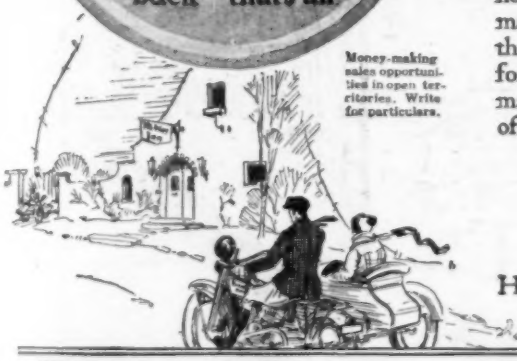

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Take a free demonstration ride with your dealer. See for yourself how motorcycling beats automobiling or waiting in the cold for street cars. Most dealers offer a Pay-as-You-Ride Plan that's interesting. Write us for free literature, showing 1924 models in actual color.

HARLEY-DAVIDSON MOTOR CO.
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The Motorcycle

Send me descriptive literature, in actual colors, showing the 1924 Harley-Davidsons and Sidecars. Date_____

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Get a Starrett and you can't go wrong. Here are some of the features that help to explain the preference of two generations of machinists for these fine Micrometers.

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Starrett design, workmanship and finish assure you of a Micrometer that is not easily sprung, is simple to adjust, and is good for years and years of reliably accurate service. You can't go wrong on a Starrett.

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The Starrett Catalog will help you select the Micrometer best suited to your requirements. Mailed free —ask for No. 22 AP.

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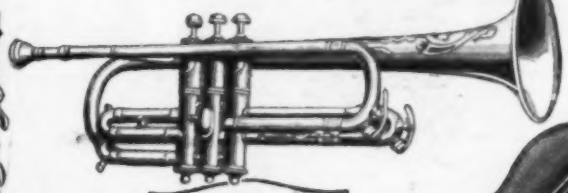

Wurlitzer Saxophones

The most popular of all wind instruments. Improvements in fingering and special conical bore make Wurlitzer Saxophones the easiest to play and unusual for rich tone values. Blows and fingers so easily that playing is as simple as whistling a tune.

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Noted for accurate pitch, and clear even tones in both soft and loud playing. Valve pistons individually ground to insure smooth, easy action and absence of leakage. Once "lipping" is mastered very little practice is required to play simple band music.

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Wurlitzer banjos guitars, mandolins, ukeleles, etc. are made with particular attention to close fit at all joints, to give true vibration and full resonance. Stringed instruments are the easiest of all for beginners to "pick up"—some can become good players almost without effort.

Any Musical Instrument

On Trial

WURLITZER will send you ***any instrument*** for a week's trial in your own home. No obligation to buy—no expense for the trial—you do not risk a penny. Wurlitzer instruments are known the world over for artistic quality and excellence of workmanship. Used by the greatest musicians, bands, and orchestras. The house of Wurlitzer has made the finest musical instrumenos for over 200 years.

Easy Payments

Payments are conveniently arranged in small monthly sums—a few cents a day will pay. All instruments to you at lowest factory prices. Special combination offers on complete musical outfits—velvet lined case, all accessories, self-instructor, etc.—everything you need at practically the cost of the instrument alone.

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The greatest musical catalog ever published! Over 3,000 articles—every known instrument described and illustrated—many of them shown in full colors. No matter where you live, you can buy Wurlitzer instruments direct by mail the same as at any of the 27 Wurlitzer stores.

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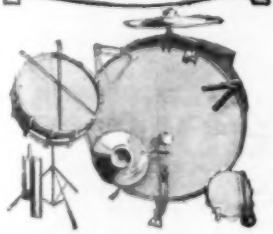
Wurlitzer Trap Drum Outfits

Every conceivable drummer's trap is included in the Wurlitzer outfits—nothing is lacking. A sense of rhythm usually means that playing the trap drums will be almost instinctive.



Wurlitzer Trombones

Tone remarkable for sonority and clearness, absolutely pure in all registers. Slides are drawn to a great hardness and perfect line, insuring easy action and perfect intonation.

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21 Perfect Jewels
Adjusted to Positions
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25 Year Gold Strata Case
Your choice of Dials (including Montgomery R. R. Dial)
New Thin Models. All sizes.

WHILE other watch dealers are raising their prices, asking you for larger monthly payments, and making payment terms harder for you to meet, we are offering you our new model Santa Fe Special, no advance in price, no money down, easier terms and smaller monthly payments. We realize the war is over and in order to double our business we MUST give you pre-war inducements, better prices, easier terms, and smaller payments.

Send No Money Without one penny of advance payment let us place in your hands to see, to examine, to inspect, to admire, to approve a real masterpiece in watch creation. Our determination to this year double our sales of the world famous Santa Fe Special and Bunn Special Watches prompts this matchless offer.

Santa Fe's "New Elite"

This Artistic dependable Ladies' Wrist Watch, fitted with genuine Illinois Springfield movement. A perfect timepiece. Beautiful 14 Karat *white* or *green solid gold* case. Many designs—Ask for New Watch Book showing New Elite case designs in color. Watch sent on approval and sold on payments.

Page 12 of Our Watch Book Is of Special Interest to You!

Ask for our Watch Book free—then select the watch you would like to see, either the famous Santa Fe Special or the 6 position Bunn Special, and let us explain our easy payment plan and send the watch, express prepaid, for you to examine. No money down.

REMEMBER—No money down—easy payments buys a master timepiece—a 21 Jewel guaranteed for a lifetime at about half the price you pay for a similar watch of other makes. *No* money down. A wonderful offer.

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"Home of the Great Santa Fe Railway"

SANTA FE WATCH CO.
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Please send prepaid and without obligation your Watch Book free, explaining your "No Money Down" Offer on this Santa Fe Special Watch.

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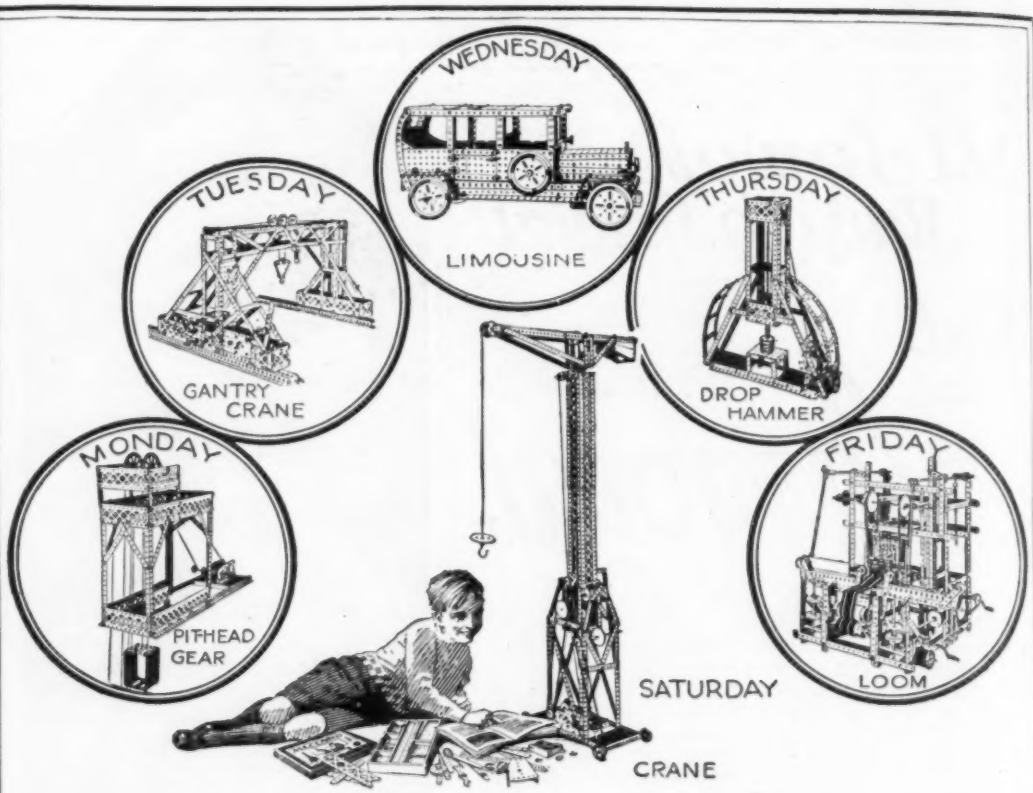

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A PERFECT crane one day, a splendid Electric loco the next—then a wonderful Pit-Head Gear, and so you go on every day for a year without once repeating a model. You do all this with the same interchangeable and unbreakable parts that always fit exactly where you want them and never get out of order.

Every part of Meccano is a real engineering piece—pulleys, gears, strips, girders, rods, couplings and cranks—all perfectly designed and accurately made.

Tell Dad You Want

MECCANO

Engineering for Boys

SEND FOR THIS NEW MECCANO BOOK

It describes Meccano and tells interesting things about model building. Every page a pleasure. Free, if you send names and addresses of yourself and three chums. Put No. 63 after your own name for reference.

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Ask your dealer for entry blanks or write us.

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Outfit	Builds	Price
No. 00	40 models	$1.00
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MECCANO COMPANY, INC. Division H-12 ELIZABETH, N. J.

In Canada: Meccano, Ltd., 11 Colborne St., Toronto

Gentlemen, this is my son

Just imagine that moment of glory—when you shall introduce that boy of yours to men of affairs—your boy, who so soon will step into the business swirl, to meet stiff competition, hard problems, dangerous temptations. To-day, your greatest joy is to "do something" for that boy of yours, and you ask: What Christmas gift will make him happiest—what will he appreciate most keenly—what will help him most?

You can answer that question right now—give him THE AMERICAN BOY, and his pride in the gift will equal your pride in him.

THE AMERICAN BOY knows that "boys will be boys"—and should be!—but it knows also that boys will be men. It attracts boys, fascinates them, and holds the eager interest of 500,000 of them by sheer merit which boys are quick to discover. It gives them information about vital things in life that they can get in no other way—shows the value of character and initiative as well as ingenuity; gives them a look-ahead and some preparation for the work-world that your boy will be stepping into almost before you know it.

Each and every story is written to let boys face a real boy-problem, and it teaches them how a regular fellow will meet and solve it. There is nothing preachy about THE AMERICAN BOY. (How boys do hate preaching!) There is nothing namby-pamby or wishy-washy about it. Its articles are instructive, boy-building, man-building, and have an instant power to suggest all that is best and healthiest to a boy.

Your boy's feet are headed somewhere. What an opportunity you have, this Christmas season, to give him a friendly and trusted guide to walk with him while he gains the poise and stature of a man. Make him a present of a year's subscription to THE AMERICAN BOY.

Your boy needs THE AMERICAN BOY—to-day more than ever. It is a boy-building necessity! It is right that he should have it! Give it to him for Christmas. Subscribe to-day!

$2.00 a year by mail. 20 cents a copy at news-stands. Subscribe for a year or leave a standing order at your news-dealer's.

The American Boy

The Biggest, Brightest, Best Magazine for Boys in All the World

THE SPRAGUE PUBLISHING CO.
No. 861 American Bldg., Detroit, Mich.

Enclosed find $2.00, for which send THE AMERICAN BOY for one year, beginning with the current issue, to

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CHEMCRAFT

THE CHEMICAL OUTFIT

Fred C. Luce, Chief Chemist, at work in his laboratory

How to be a Boy Chemist!

Fred C. Luce tells all boys how to have fine sport with a dandy chemical club.

"CHEMICAL experimenting is the finest fun I ever tackled," said Fred in a recent letter. "If you want to do something new and different every day; something that will keep you busy and interested all the time—get a Chemcraft outfit and be a boy chemist. Then you can test the things you eat, wear and use every day; make ink, soap, dyes, and work hundreds of other wonderful experiments with your own laboratory, the same as I do. It'll be more sport than you ever had before. Sure, you can do a lot of funny, puzzling tricks, too, that will keep everybody guessing. I've got a dandy 'lab,' and it started with a Chemcraft outfit. When I got my outfit I started my own Chemistry Club under my own name and we have dandy times running shows and doing new experiments all the time. I'll tell any boy who wants real sport to get a Chemcraft outfit and be a Boy Chemist."

You can do the same as Fred. A CHEMCRAFT outfit makes you an amateur chemist and opens the way to days of fascinating fun. It also teaches you practical things about the most wonderful science there is today. Get a CHEMCRAFT outfit this Christmas. Then you can join the Chemcraft Chemist Club, be the Chief Chemist of your own Local Chapter and get other boys in with you. You'll get the Club Magazine, too and can exchange letters with other Club members everywhere. Select from these five fine outfits: No. 0, 75c; No. 1, $1.50; No. 2, $2.50; No. 3, $5.00; and No. 4, $10.00. Each outfit is complete and contains a liberal assortment of harmless, non-explosive and non-poisonous chemicals, all necessary apparatus and a Manual of Instruction.

This boy has Chemcraft No. 3. Isn't it a dandy outfit?

Be sure you get CHEMCRAFT because that is the original and best chemistry outfit; the one used in schools and colleges and endorsed by teachers and professors. CHEMCRAFT is sold wherever good toys are found. Ask for it by name—CHEMCRAFT. If you cannot get the outfit you want, we will fill your order direct upon receipt of price as above. West of Denver, Colo., and in Canada, these prices are 10% higher.

FREE TO BOYS!

Write at once and get a Free Copy of the Club Magazine; full of prize-winning stories written by boy chemists, and other Club news. **It's free to boys who write at once.**

THE PORTER CHEMICAL CO.

Porter Products Put Science at Your Service

115 Washington St., Hagerstown, Md.

How three boys built a railroad

THREE boys sat disconsolately on the edge of the pond back of the old mill on the Jenkins' place. All week they had been building a railroad in the sand along the banks. They had leveled, and dug, and built up until they had the bed laid for a whole transportation system. There were grade crossings, and bridges and freight yards and even a tunnel. While along the edge of the pond Wally had built docks and ferry boat slips. But as Bob said, "What good is a railroad without any cars?"

"Why all the gloom, men?" said a pleasant voice behind them. The three boys looked up to see Mr. Jenkins, Bill's father.

Bill explained the lack of "rolling stock" for their railroad.

"Well!" said Mr. Jenkins, "Why don't you fellows chip in and get track and trains? In New York I've seen some beauties that operated by electricity. They were exact duplicates of the big ones that run on the Central."

"Chip in?" asked Wally, showing empty pockets, "Chip in what?"

"My golly!" said Mr. Jenkins. "Anybody'd think you fellows were cripples. When I was a boy, if I wanted anything bad enough, I just went out and earned the money and got it. I know Bob there could make some money if he'd saw that big pile of wood I saw yesterday out in the back of his Dad's place. Wally can pick the apples down in the orchard and I'll find something for Bill to do. Get busy and see what you can earn. And then I'll tell you what I'll do! I'll give you a dollar for every dollar you earn. How's that, fair enough?"

"O boy!" Bob cried.

"Let's see that orchard!" said Wally.

"Let's go!" shouted Bill, getting up in a hurry.

First meeting of the R. W. & W.

A MONTH later, the first meeting of the R. W. & W. Railroad (R—Robert, W—William, W—Walter) was held. Mr. Jenkins collected the money the boys had earned for the railroad.

Wally had seven dollars, Bill eight and Bob ten.

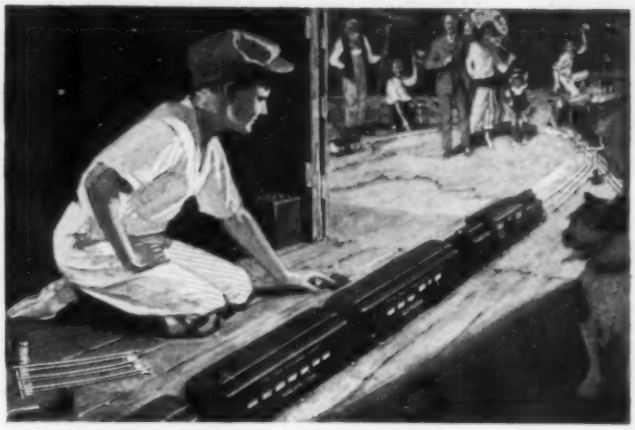
"That makes twenty-five dollars," announced Mr. Jenkins. "And now, as I said I would, I'll match your capital with the same amount." He took two new ten dollar bills and a five from his pocket and put them with the boys' money. "Total capital of the Railroad—fifty dollars."

"And now, gentlemen, if you three will meet me tomorrow morning early, we'll all go into New York on the eight o'clock and purchase 'rolling stock' for the railroad."

They buy "rolling stock"

WHAT a day those four had in the city!

Mr. Jenkins took the three boys down to the Ives Display Room in the Fifth Avenue Building at Madison Square.



On great tables, which ran all around the big display room, were complete railroad systems. Powerful electric engines, perfect models of their big brothers on the Central, thundered along with mail coaches and Pullmans. A freight engine rumbled by, pulling a long line of flat cars, tank cars, and cattle cars, and in the rear a caboose. The boys looked on wide eyed and noticed that each car was a ***perfect model*** of the real thing, even down to the monograms on the cars, which showed the cross of the Santa Fe, the seal of the N. Y. C. & H. R., the red and white circle of the Canadian Pacific.

There were semaphore signals, which showed red and green lights. Crossing signals that rang a warning bell as the Flyer approached. Trestle bridges, tunnels, freight and passenger stations, telegraph poles and street lights. In fact everything that you have ever seen in a big railroad.

There was a shriek from Wally.

"Oh boy! Look at these." He had found a big table on which were ocean liners, freight steamers, submarines, tug boats and racing yachts. "Gee! Couldn't we have some ships, too?"

"How about it, boys," suggested Mr. Jenkins, "couldn't we make Wally Captain of the Port and let him handle the ocean transportation?"

Everyone agreed to this and Wally, with the professional eye of a sea captain, picked out a liner, a tug boat for hauling freight, and a diving submarine for harbor defense.

The grand opening

A WEEK later, down behind the old mill, there was a scene of tense excitement. Lined up on the bank were Mr. and Mrs. Jenkins, Molly—Bill's little sister, Ambrose—the colored man who cut their lawns, and Rags, the dog. Bob knelt on the ground beside a switch. Wally fussed with the mooring ropes of a liner which rode proudly beside her pier. Bill fastened an American flag to the halyards on a pole. All along the bank, ran the new railroad's tracks gleaming in the sun. The semaphore signals showed "Clear track ahead."

"Ready!" cried Bob.

"Ready!" answered Wally and Bill.

Rags barked. Mr. Jenkins waved his hat and Mrs. Jenkins her parasol. Ambrose clapped. Molly shrieked.

Then Bob turned the switch and out of the door of the old mill rolled the Flyer, headlight gleaming, parlor cars lighted. Along the bank it flew, round curves, through tunnels, over bridges. Then came a long freight loaded with lumber and gravel for "overseas." Down to the water front it went and there stopped alongside a pier.

"How about the R. W. & W.!" shouted Bob.

"Yea!" hollered Bill and Wally and Mr. Jenkins and Ambrose.

Suddenly little Molly began to cry as though her heart would break.

"Why, dear, what's the matter?" asked Mrs. Jenkins.

"I wish I was a boy," sobbed Molly.

And after all you couldn't blame her much—could you?

On November 30th at 8:30 P.M. Mr. H. C. Ives will give radio talk "The Fun of Playing with Trains," Station W.E.A.F., wave length 492 meters.

THE IVES MANUFACTURING CORP.
208 Holland Ave.,
Bridgeport, Conn.

I enclose 10c for which please send me your new smashing 28 page book that shows how to build an Ives Railroad. This book will also tell me about the Ives Fleet of Boats.

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Build This Transcontinental Receiver At Half the Usual Cost!

Ordinarily You Would Pay From $125.00 to $250.00

This Way You Pay Only $65.00

Erla synchronizing radio frequency reflex transformers provide unequaled magnification without distortion. Types, reflex 1, 2. List, $5

Providing utmost sensitiveness with perfect stability, the Erla fixed crystal rectifier is uniquely adapted for reflex work. List, $1

Dealers and Jobbers—No day passes that Erla does not increase your opportunities for sales and profits. Write for sample Erla Triplex receiving sets, in beautifully finished solid mahogany cabinets, at manufacturers cost, for demonstration to your trade

So simple and inexpensive to build is the Erla transcontinental Triplex receiver that every home can now enjoy the infinite pleasure and variety of nation-wide loud speaker reception.

Erla parts, complete even to the cabinet and panel, and Erla solderless connectors, make child's play of the work of assembly. Accurate, easily understood drawings guide every step.

Materials are reduced to a minimum through the employment of Erla synchronizing transformers, enabling vacuum tubes to do triple duty. Only three tubes are used, yet costliest multi-stage amplifiers are surpassed in range and volume.

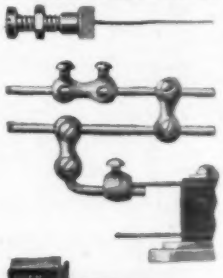
Choice of broadcasting programs is exercised at will, so sharp and selective is the tuning. Yet controls are so few and simple as to be operated by any child. Especially remarkable is the purity and fidelity of reproduction, exceeding the finest phonograph.

For further information regarding Erla Triplex, as well as perfected Erla one and two-tube receivers, consult Erla Bulletin No. 14, obtainable gratis from leading radio dealers. Or write us direct, giving your dealer's name.

Electrical Research Laboratories
Dept J 2515 Michigan Avenue, Chicago

ERLA

The unique ability of Erla synchronizing audio transformers to reflex properly enables vacuum tubes to do triple duty. List $5



Difficult, dangerous use of soldering irons is eliminated by Erla solderless connectors, saving time, temper and money. List, 5c ea.

Hand Forged Razor Steel Blades, No. 57

Direct at Factory Prices

This $2 KNIFE $1.18 Postpaid

Hand Forged Razor Steel Blades

Handy shaped Blade makes this knife best for mechanics, sportsmen and farmers; light but strong; resharpened easily. Stag handle. German silver finish; blades file tested, hand forged from razor steel and warranted.

Sample $1.18 3 for $3.00 Postpaid.

Send for our 100-page List and *"HOW TO USE A RAZOR"* **FREE**

MAHER & GROSH CO., 106 A St., Toledo, Ohio

ONLY $3 DOWN and you keep this typewriter

DIRECT to you from our Factory

Big Saving In Price

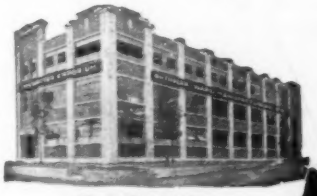
Yes, we will ship you this

Genuine Underwood

Rebuilt in our own factory just like new for

ONLY $3 down—NOT ONE CENT MORE

Until you have tried the machine 10 full days at our expense



Our Factory

EVERY MACHINE is fully guaranteed. **New** parts wherever needed. **New** enamel, **new** nickel, **new** lettering, new platen, new key rings—**a** complete, perfect typewriter. Impossible to tell it from a brand new Underwood either in appearance, durability or quality of finished work.

An up-to-date machine with two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc. In addition we furnish FREE waterproof cover and special Touch Typewriter Instruction Book. **You can learn to operate this Underwood in one day.**

Write Right Now

and learn how it is possible for us to ship you this Underwood Typewriter upon our **free trial** plan and our direct-to-you **money saving methods.** Get the full details now—just sign the coupon and mail **today.** Get all the facts—then decide.

From Factory to You

No Obligation

—**to buy.** You don't have to order. **Just sign the coupon,** send it to us and we will mail you our **big catalog** absolutely **free.** You will be amazed at the liberality of our offer, the beauty and all around excellence of our typewriters.

Send the Coupon Today

This is the genuine Underwood Typewriter. We offer you the same three models of the Underwood Typewriter being made and sold by the manufacturers today. **Standard 4-row single shift keyboard.** Absolutely visible writing—the **full line** of typewriting is visible at **all times.** All the improvements and attachments that any high grade typewriter ought to have.

Big Saving to You

Our plan of selling to you **direct** makes possible enormous savings, which are all for your benefit. **Send in the coupon and we will send you prepaid** our big catalog, including "A Trip Through Our Factory." This shows how the Shipman-Ward Rebuilt Underwood is the best that can be produced at our **Special Price.**

Big Book FREE

Our big handsomely illustrated catalog will be sent **free** on request. It tells you all about the advantages of owning a STANDARD SIZE UNDERWOOD; how and why this machine will last for years, saving many dollars not only in the purchase price but in its operation.

Send in the coupon and let us send you this beautifully illustrated book **FREE** without any obligation whatever.

10 Days' Free Trial

You have ten full days in which to try the typewriter before deciding whether you want to keep it. Give it every test—see for yourself—make the Underwood prove its worth to you. Don't take our word for it—put the Underwood before you and see if you don't think it the greatest typewriter bargain ever offered.

You

don't have to do a thing to get our big **Free** catalog and complete details of our amazing typewriter offer except to sign and send in the coupon. There is no obligation.

FREE TRIAL COUPON

SHIPMAN-WARD MFG. CO.
2129 Shipman Bldg., Chicago

Please send me FREE, all charges fully prepaid, your BIG NEW catalog of UNDERWOOD TYPEWRITERS and complete details of your FREE TRIAL Offer.

It is understood that I am under no obligation whatever and that this is to be sent without one cent of cost to me.

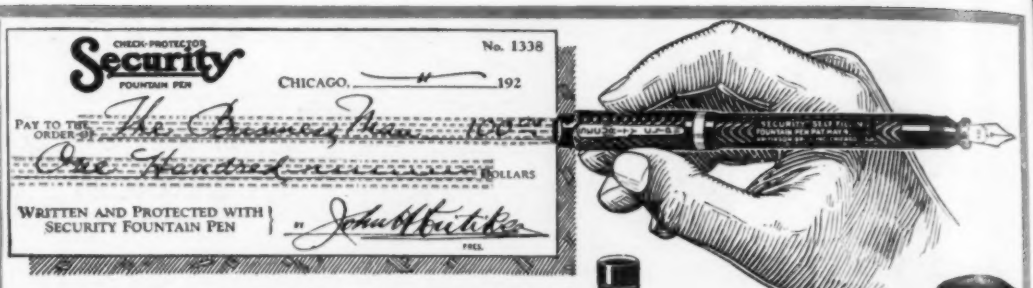
Name .....

Street .....

City ..... State .....

Shipman-Ward Mfg. Co.

"Typewriter Emporium" **2129 Shipman Bldg.**
Montrose and Ravenswood Aves., Chicago



GET READY!

The Holiday Season Is Approaching!

50% of the Fountain Pens Sold Each Year Are Sold During the Months of November and December

A Large Percentage of These Will Be "SECURITIES"

THIS is the most wonderful opportunity for honest, live wire salesmen and saleswomen not only to make a clean up during the holiday season but also an exceptional opportunity to join an honest to goodness progressive organization and engage in a clean, profitable and permanent business, that had such a meteoric growth and phenomenal success in such a short period.

The Following Figures Tell The Story

Our sales for the first year—1922—amounted to 15,000 pens.

Sales up to the present have reached 150,000 pens and we are going to sell 150,000 more "SECURITIES" between now and the first of the year! And we have only started.

Our Goal for 1924 Is One Million (1,000,000) Securities

But we are not going to stop there either! Our aim is to make the "SECURITY" the leader in the field.

We have moved twice during the last ten months and are preparing to move again. This time however, not only to larger quarters, but to our own "SECURITY" building. DO YOU KNOW WHY?

BECAUSE THE "SECURITY" HAS MERITS, embodying novel, practical and patented features which combine a faultless, smooth-writing, even-flowing pen with a unique and perfect check protecting device equal to the most expensive check writer on the market and so convenient that it enables the owner to write and protect his checks **any time, any place.**

YOU DON'T HAVE TO SHAKE OR COAX THE "SECURITY" TO MAKE IT WRITE. **It responds instantly the moment it touches the paper** and will write, write and write without any LEAKS OR BLOTS, until the last drop of ink is out.

Seventeen years have been spent in developing this MASTER PEN by men, who for a decade, have been engaged in the fountain pen industry.

The sales possibilities of the "SECURITY" are unlimited. You don't have to look for prospects—they are around you everywhere.

Ambitious and energetic men and women who are anxious to better their condition, will find in the "SECURITY" a wonderful opportunity to realize their ideals.

You will make real friends of those to whom you sell "SECURITY" Pens because you give them **honest merchandise with full value received.**

The "SECURITY" is manufactured complete from end to end in our own daylight factory by experienced and contented employes, and is THE ONLY FACTORY OF ITS KIND IN THE UNITED STATES OPERATED UNDER THE PROFIT SHARING PLAN.

AGENTS—DISTRICT MANAGERS—QUALIFICATIONS

AGENTS—Honesty and a sincere desire to work. We have developed at considerable expense, a complete method of training which is worth real money to you. Write immediately for our interesting proposition.

DISTRICT MANAGERS—We select as District Managers, men from the ranks of our successful agents, who have shown exceptional sales records. **To you more qualified salesmen**, who have had sufficient experience in organizing and maintaining an efficient sales force, we have a mighty interesting proposition. Write us a letter, giving a brief history of yourself, your past experience, references and territory wanted.

TO AVOID LOSS OF TIME AND UNNECESSARY DELAYS ORDER A SECURITY TODAY before taking further action and send with your lettercheck or money order for style wanted. A cut-out pen for demonstrating purposes will be included free of charge. When you receive the pen, give it a fair trial. Then show it to your friends and some business men of your community. Its reception will more than surprise you. You will get orders without soliciting them. If on the other hand you don't find the "SECURITY" as represented, you may return it to us C. O. D. for full purchase price. THIS IS A GO! WE MEAN BUSINESS.

Security Pen Corporation, Dept. 120 P. M.,
900-910 W. Jackson Blvd., Chicago, Ill.

Gentlemen: I am interested in your proposition from the standpoint of ☐ DISTRICT MANAGER ☐ AGENT. I wish to devote ☐ FULL TIME ☐ PART TIME. In the following territory. **Explain in full.**

.....

.....

Enclosed find check money order $.....
Send me one Security Pen No..... ☐ Long ☐ Short ☐ Medium
☐ Fine ☐ Stub ☐ Coarse in ☐ Flexible or ☐ Stiff Action.
Also ☐ DEMONSTRATING OUTFIT FREE.

Name.....

Address.....

City.....State.....

An unconditional FIVE YEAR written guarantee is furnished with each Pen.

PRICES

No. 300	$3.50	No. 600	$5.00
No. 400	4.00	*No. 800	7.00

Long and Short models.

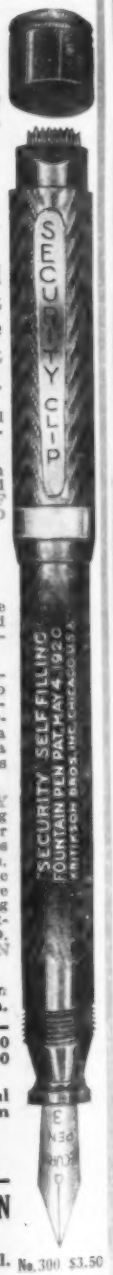
***Giant Security made in a beautiful red and black (mottled) finish has an exceptionally large ink capacity.**

PRICES IN CANADA
$5.00—$6.50—$8.00—$10.00

SECURITY PEN CORPORATION

DEPT. 120 P. M.

900-910 W. Jackson Blvd., Chicago, Ill.



No. 300 $3.50

I Will Prove To You That You Can Make $100 a Week

Yes, you can make $100 a week. You can make $5,000 a year and not work half as hard as you do now. You can do as well as H. T. Pearl, of Oklahoma, who made $750 in one month. You can begin like R. L. Marshall, of New Jersey, who made $80 in five hours. You don't have to wait. You don't have to invest any money. You don't have to take any course or do any studying. You can start right in next week. You can begin at once to make a really big income. The opportunity is waiting. The money is there for you to get. Do you want it? Then read this ad carefully and answer it, for this offer is meant for you.

Your Profits Will Begin At Once

These records show you how our Representatives make large profits the first day. You can easily do as well.

$16 Profit First Day

That's the record of Alyse Leblanc, of Massachusetts.

$32 Profit in 8 Hours

is the result of the first day's work of Adolph Montoya, of New Mexico.

$4 in One Evening

is pretty good pay for 2 hours' spare time. That is what Samuel Miles, of Arkansas, made his first day.

$13 Profit First Afternoon

Jacob Myron, of Connecticut, started in the morning and cleared over $13 before evening.

$4 an Hour

was what Margaret La Roux, of Michigan, averaged her first afternoon.

$40 in 24 Hours

was the result of the first work of B. Collander, of Massachusetts.

700 Men and Women Wanted at Once

We are now ready to appoint 700 more Representatives in all parts of the country. You can be one of them, and by simply doing what we suggest you can make a net, clear, cold profit for yourself of anywhere from $50 to $100 a week with very little effort. Your first day will bring you big money. W. A. Webster, of Virginia, made $6 in 1½ hours; Dennis Spear, of Kansas, cleared $8.90 his first day; W. P. Stone, of Maine, made $24 in 4½ hours. All without experience or training and you can do as well, or better.

Amazing Profits for Easy Work

We are the originators and manufacturers of Zanol Products—the nationally advertised line of pure food products, toilet preparations, soaps, perfumes, household and laundry necessities—over 350 different kinds. Four million dollars' worth were bought last year but none of these products are sold in stores.

We sell direct from factory to customer. By this means we give greater values and lower prices than could be secured in stores. We have thousands and thousands of customers in every section of the United States. But instead of sending their orders direct to us we appoint a Representative in each locality through whom our customers send us their orders.

Exclusive Territory

We offer to assign you an exclusive territory and let you handle all our dealings with our customers in that territory. You will simply introduce our products and let the people know that you have become the Zanol Representative. The rest is easy. Our products are nationally advertised and well known in every locality. We have been in business for 16 years and have resources of more than a million dollars. The local man or woman who becomes our Representative is given complete instructions, full equipment and everything necessary for success.

More Than a Million Dollars Made By Our Representatives In 8 Months

If you want your share of these big profits all you need do now is write. You won't believe how easy it is nor what wonderful profits you can make until you get started and the money begins to roll in.

We furnish all of our people with complete equipment for doing business. We furnish it free. We tell you in detail exactly what to do. We make it easy for you. We help you in every way to get started quick and to make big profits without waiting or delay.

You will be given the same proposition that has brought thousands of dollars in cash to E. S. Shelly, of Pennsylvania; Mrs. Nona Kerns, of Mississippi; Edgar Banville, of Massachusetts; and dozens of others. It has enabled G. C. Henry to make four times as much money as he ever did on a farm and G. A. Becker, of Iowa, to earn more than he did in 22 years in the grocery business.

Send No Money

Just send me your name and I will tell you how to get started. I will give you all the details. I will show you how you can make $100 a week and even in your spare time $5 to $10 a day for a few hours' work. I will show you how you can have a permanent, profitable, honorable, pleasant and fascinating business that will bring in a bigger income than you ever thought possible. It is the one opportunity that you have been waiting for. It is your chance to get ahead. It means thousands of dollars to you. And you are not risking a penny. You are not agreeing to pay anything or do anything.

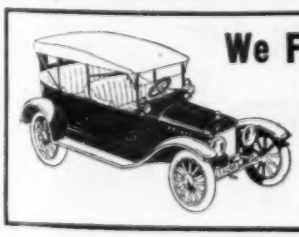
So mail the coupon. Don't wait until someone else gets in ahead of you. Don't delay until it is too late. Write now.

THE AMERICAN PRODUCTS CO.

Albert Mills
President and General Manager

Dept. 4873, Cincinnati, Ohio

We Furnish An Automobile



We want you to realize that this is a high-grade proposition. We want to help you in every way to make large profits and we offer to provide a car without any expense to you whatever. Just write for our proposition. Mail the coupon for details of the plan that will give you this automobile without expense and from $10 to $30 a day in cash.

Mail This NOW

Albert Mills, President,
The American Products Co.,
Dept. 4873, Cincinnati, Ohio

Please send me, without one cent of cost and without any obligation, complete details of your new plan by means of which I can make from $50 to $100 a week.

Name .....

Address .....

.....

(Write plainly)

The Merriest Christmas of All—

Bright and early Christmas morning you and your boy will be running his Lionel Train, enjoying the "thrills" of the World's most fascinating and educational toy.

Lionel Trains and Miniature Railroad Equipment are exact reproductions of those used on America's leading railroad systems.

Lionel locomotives are powerful enough to haul a train of twenty or more cars around curves, through tunnels, over bridges and across switches.

The realistic Lionel equipment includes Crossing Gates that automatically lower as the train approaches and raise as it passes by. Electric Block Signals flash "Danger" and "Clear Track Ahead," while Electric Warning Signals ring at the crossings.

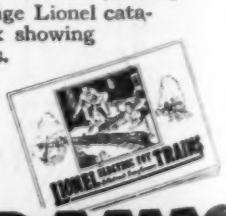
Lionel products have all the up-to-the-minute improvements in modern railroad design and construction. All Lionel Locomotives, Cars and Accessories are of steel construction and practically indestructible.

For 23 years Lionel Electric Trains have been electrically and mechanically perfect—fully guaranteed. They are attractively finished in rich enamels and baked like automobile bodies.

You can see Lionel Trains in operation at the best toy, hardware, electrical, sporting goods and department stores.

Complete Lionel Outfits sell from $5.75 up.

Send for the new 48-page Lionel catalogue—a handsome book showing the complete line in colors. It's Free!



THE LIONEL CORPORATION
Dept. 14, 48-52 East 21st Street, New York City
"Standard of the World" Since 1900

LIONEL ELECTRIC TOY TRAINS
& Multivolt Transformers

NEW CHEAP FUEL

For Cooking and Heating

—Gives greater heat at less cost
—Does away with coal and wood

An amazing new scientific fuel—that you make right in your own cook stove or heating range—ends forever the dirt and drudgery of coal and wood. This marvelous new invention, set into the fire box, converts any cook stove or range into a real gas stove—in one minute. All the heat you want for cooking and heating at the simple turn of a valve. **No fire to build, no coal to buy, no wood to chop, no ashes to carry out or litter your floors and scatter dust over the whole house. No shivering in winter—no sweltering in summer.**

Why Gas-Fire Is Better Than Coal or Wood

1 Because Gas-Fire is a scientific fuel made right in your own cook stove, range or furnace from the most efficient and cheapest fuel known—kerosene.

2 Because Gas-Fire creates a steady, non-carbon flame of intense heat from a vapor mixture of only 4% kerosene and 96% air. It is the only device that really makes a gas, and burns this gas as cleanly and silently as a city-gas stove.

3 Because Gas-Fire operates from **three** to **four hours** on one gallon of kerosene, making (according to U. S. Government tests) heat units equal to 500 feet of city gas, or 100 lbs. of the finest coal.

4 Because Gas-Fire, although scientific in principle, is extremely simple—with no mechanical parts to get out of order—no wicks to trim or replace — no chimney to clean daily — nothing to burn out or break.

5 Because Gas-Fire is equally efficient Summer and Winter. Its heat can be regulated to perfection for any and all cooking, baking or heating.

Cheapest and Best Fuel Known

This wonderful invention, which gives far more heat than either coal or wood, burns a scientific gas composed of 96% air and 4% coal-oil (kerosene, the cheapest and hottest fuel known). The result is a steady, even, clean fire as hot or as low as you want.

Just Turn a Valve

Never before anything like this new device called the "Gas-Fire" Burner. A "Gas-Fire" actually makes your old stove a gas stove. Real gas burners—no wicks—no smoke or odor, for all the gas is consumed. A simple valve puts the heat at your control, and controlled heat is the secret of perfect cooking, baking, and roasting.

Fits Any Stove or Range

No holes to drill. No injury at all to your stove. Nothing to do but set this simple device into the fire-box and you have a wonderful new gas range. **Lasts a lifetime.** No mechanical or moving parts to break or get out of order. **Absolutely safe.**

Send for Free Book

Write quick! The "Gas-Fire" Burner is a nation-wide sensation. Thousands of housewives and home owners proclaim it the greatest invention of the age. Send for free book and special low introductory price offer. No obligation. Mail coupon now!

Gas-Fire The Modern Fuel

30 Days' Free Trial!

The "Gas-Fire" Burner will give you a gas stove as efficient as any city-home one—but we don't ask you to accept our word for it. Try it in your own stove or heater 30 days free. See for yourself what a wonderful labor and time saving device it really is.

THE HEAT APPLIANCE CORP.
103-105 N. May Street CHICAGO, ILL.

THE HEAT APPLIANCE CORP.,
103-105 N. May Street, Chicago, Ill.
Please send me free your beautifully illustrated and special 30 Day Free Trial Plan.
I am interested in a Gas-Fire Burner for a
☐ Cook Stove ☐ Heating Stove
☐ Check here if interested in unusual agent's proposition.

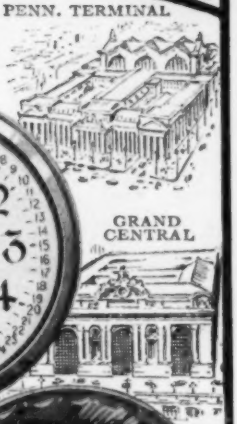
Name.....
Address.....
City..... State.....

ONLY $2 DOWN

FAMOUS-21-JEWELED ILLINOIS RAILROAD WATCH

BUNN SPECIAL

$5.50 A Month



We guarantee this watch to pass railroad inspection **on any railroad in the United States.** The requirements for passing railroad inspection are so severe that only the very finest watches can pass them. **This watch is adjusted to six positions, although railroad requirements call for only five.** A full description of the movement will be given if desired. Better still, order it on trial.

GUARANTEED 25 YEARS

This famous Bunn Special movement is put in a 25 year gold filled case that will wear like solid gold for more than 25 years. We guarantee it against any defect in material or workmanship. These movements are built to give a lifetime of satisfactory service just as the two famous Terminals pictured above were built to last for generations.

30 DAYS' TRIAL: 10 MONTHS TO PAY

You can test this watch in your own pocket for 30 days with the distinct understanding that if you return the watch we will return every penny you paid. Order it now or write for any additional information desired. Get our big catalog.

STERLING DIAMOND & WATCH CO.

Established in 1879

63 Park Row Dept. 682 NEW YORK

STERLING DIAMOND & WATCH CO.,
63 Park Row, Dept. 682, New York.
Gentlemen: Please send the famous BUNN SPECIAL, 21 jewelled Illinois Watch, as described above, to me on 30 days free trial. I enclose $2.00 deposit to show my good faith. If I am not satisfied and return the watch within 30 days, you will return my money. **If I keep the watch I will pay you $5.50 every month for ten months until the total price of $57.50 is paid.** Title to this watch remains with you until I have paid you in full. It is understood that you fully guarantee this watch to be as described. Please send your catalog.

YOUR NAME _____
LOCAL ADDRESS _____
CITY & STATE _____

Please Mention Popular Mechanics

CHARGE YOUR RADIO *or* AUTO BATTERY OVERNIGHT FOR A NICKEL

GOLD SEAL HOMCHARGER
The World's Most Popular Battery Charger

—silently and efficiently charges your radio or automobile battery over night for a nickel. No stopping—no sticking—no muss—no fuss—no trouble. Self-polarizing—high charging rate—finished in mahogany and gold—approved by Underwriters. Price $18.50 complete with ammeter ($25.00 in Canada)—no extras to buy. At all good dealers.

LOOK FOR *and* INSIST ON *the* GOLD SEAL

WRITE FOR FREE BOOKLET AND LIST OF BROADCASTING STATIONS

THE AUTOMATIC ELECTRICAL DEVICES COMPANY
129 W. THIRD ST.
CINCINNATI

New Powerful Light

"Gets More Eggs"

Patented **300 Candle Power Lantern** equals safety, convenience, brilliancy of electricity at 1-10 cost. Hang it in the hen house night and morning. Gives soft, bright, white light—like daylight. **Burns 96% air—4% fuel**—gasoline or kerosene. Clean, odorless, positively safe. 20 times brighter than wick lantern on half the fuel. Lights with match—no wicks—no chimneys. Guaranteed.

Free Trial—30 days at our expense. Pays for itself in week or two. Send for money-saving introductory offer and big descriptive catalog giving valuable poultry facts, **Free.** Send your name today.

Agents!—Make Big Money
Write for Free Outfit Offer

THE AKRON LAMP CO.
2192 Lamp Building AKRON, OHIO

Build Your Own PHONOGRAPH

IT'S EASY WITH OUR HELP

SAVE OVER HALF

A few hours' interesting work saves over half and gives you a machine to suit your ideas. We furnish motors, tone arms, case material, blue prints and full instructions. Plays any record. Make fine profit building phonographs for your friends.

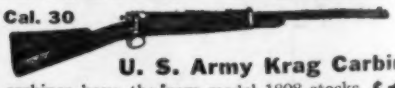
Write today for our Blue print offer. **FREE**

GET YOUR **RADIO SUPPLIES** FROM US

Choraleon Phonograph & Radio Co.
1223 1st St., Elkhart, Ind.

KIRK'S GOODS

Cal. 30



U. S. Army Krag Carbines

All carbines have the new model 1898 stocks. The barrels, actions and parts are either new or have been refinished by the Government, and are equal to new. Krag Sporting Rifles, $14. Krag Rifles, $12.50. Also Krag parts. Ammunition, 4c each. **$15**

HOME GUARD OLIVE DRAB **OVERCOATS**

Brand new. Like cut. All sizes. Weight, 5 to 7 lbs. Parcel Post Extra. An excellent coat for dress or work. Send for Complete Catalog. **$3.50**

W. STOKES KIRK 1627-PM North 10th St. PHILADELPHIA, PA.

The TOWN CRIER of TODAY

IN the quaint old villages and towns of long ago, when each community was a world unto itself, the Town Crier played an important part in the affairs of the day. With clanging bell and stentorian voice, he broadcast the news, perhaps weeks old, that occasionally drifted in from outside places.

Today news from all parts is immediately available right at your fireside. No matter how isolated your abode, Radio binds you to civilization. By a turn of the dial, the happenings, entertainments and amusements of the world are yours to command.

The Crosley Manufacturing Co. has done much toward bringing this new wonder within the reach of all and has made Radio a living, tangible thing—something to use in daily life, in business or pleasure.

Popularly priced, these famous receivers give perfect performance. Unsolicited letters are received daily from owners telling of satisfaction and new distance records.

Everyday tests prove to us that Crosley instruments are the most simple and efficient Radio receivers ever offered to the public, regardless of cost.

For Sale by Good Dealers Everywhere

Write for complete catalog. This fully describes the Crosley line of Radio parts and receivers which range in price from a 2 tube set at $28 to a beautiful Console Model at $150.

CROSLEY

Model X-J

$65

Crosley Model X-J, Price $65

A 4 tube radio frequency set even better and with greater refinement of detail than the famous Crosley Model X, Price $55. It combines one stage of Tuned Radio Frequency Amplification, a Detector, and two stages of Audio Frequency Amplification. A jack to plug in on three tubes for head phones, the four tubes being otherwise connected to loud speaker, new Crosley Multistat, universal rheostats for all makes of tubes for dry cells or storage batteries, new condenser with molded plates, filament switch and other refinements add to its performance and beauty.

Nowhere can a better receiver be purchased at any price.

Cost of necessary accessories from $40 up.

List prices on our equipment west of the Rockies 10% higher. In Canada add duty.

CROSLEY
Better-Cost Less
Radio Products

The Broadcasting Station WLW is maintained by the Crosley Manufacturing Co.

Crosley Manufacturing Co.

POWEL CROSLEY, Jr., President

1215 Alfred Street **Cincinnati, O.**

MAIL THIS COUPON TODAY

Crosley Manufacturing Co.,
1215 Alfred St., Cincinnati, O.

Gentlemen: Please mail me free of charge your complete catalog of Crosley instruments and parts together with booklet entitled "The Simplicity of Radio."

Name.....

Address.....

"Yankee" Tools in Christmas Boxes

YOU know how pleased you would be if you opened a rich holly box on Christmas morning and found the "YANKEE" tool that you had wanted so long.

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Ratchet Hand Drill **No. 1530**—only 10½ in. long; weighs only 1¼ lbs. All five adjustments of No. 1555.

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Inspect it—
point by point

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2 The second point of superiority is the Clean Cut Graduations. The first graduating machine in America was a Brown & Sharpe.

3 The third point of superiority is the accurate Fit of the Spindle and Anvil, testified by the many Brown & Sharpe Micrometers in use 30 or 40 years and giving faithful, accurate service today. Now we invite your inspection of the complete superiority of Brown & Sharpe Micrometers, point by point.

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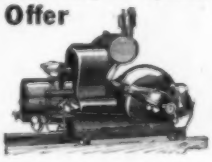

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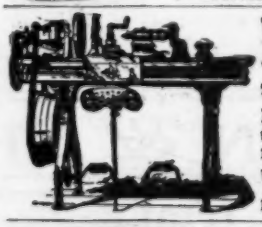

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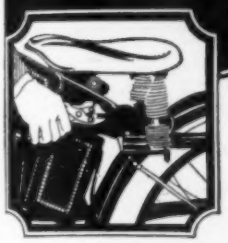

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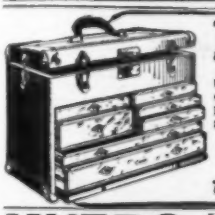

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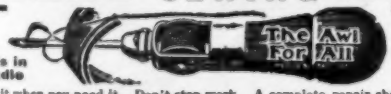

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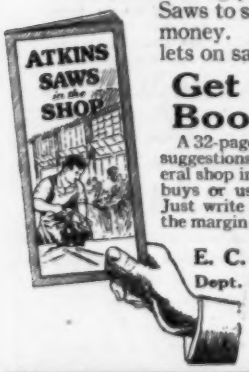

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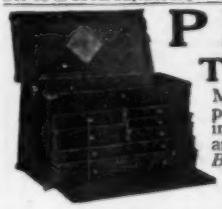

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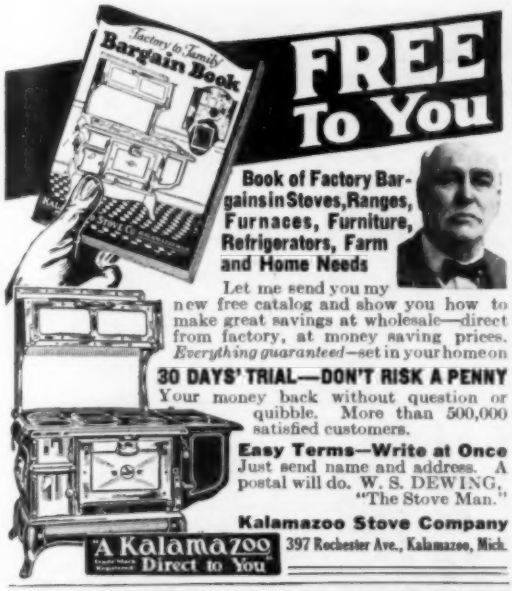

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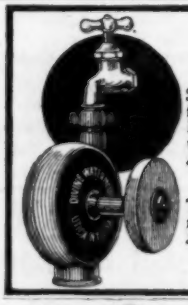

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$60 TO $200 A WEEK

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allowed, no matter where you live. If not more than pleased with our values, return violin **AT OUR EXPENSE**—and no harm done. Ability to play the violin brings social and financial success. Get a violin with a rich, mellow tone and it will create within you a desire to master it.

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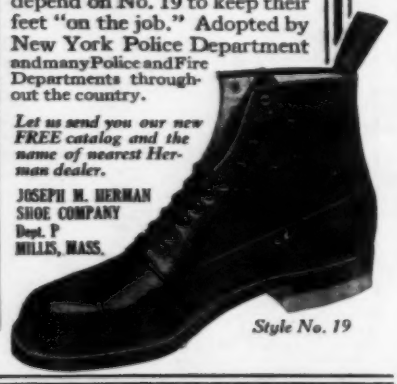

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BULLETIN

You, too, can make $150.00 weekly

This is Ed. Beck, N.Y. Joined my sales staff last spring. **Averaged $150 a week ever since.** Sells FARM BULLETIN BOARDS in thousand lots. **Often makes week's salary in single day!** It's an entirely new idea; has no competition. Virgin field. Nothing exactly like it. Hale, Mass. cleaned up **$550** within sixty days. Hanson of Me. **ran about $125** weekly for the past three months. Wood, Ia., **averages $125** every seven days. Tozier, Ga., calls on big business houses and **pockets from $50 to $260** on each order. Dozens, like Stead, of Ind. are averaging from **$60** to **$90** weekly. Sales really phenomenal. **It's the new idea that takes.** Roadside farm markets spreading like wildfire. Every farmer needs a specially constructed bulletin board that takes chalk marking. Box lids, shingles and improvised signs too crude. They are wild about FARM BULLETIN BOARDS. Gladly erect them n their front yards close to the roadside.

Ed Beck Writes:

"I have had some very good selling propositions in my day, but this FARM BULLETIN sales idea has them all beaten!"

No Bell Ringing. You Sell Only to Big Business Men!

Merchants, bankers, oil companies, battery men, auto agencies, etc.,—are quick to see the advertising possibilities of FARM BULLETIN BOARDS. They gladly buy hundreds of Boards with their advertising on the bottom and give them to farmers. Farmers erect them at once in full view of highway and chalk up offerings of produce, fruit eggs and dairy products. It creates good will among farmers. It also gives firm that distributes BULLETIN BOARDS free out-door publicity. Iowa Co. bought and **gave away 3,000.** Co-operative Milling Assn. **distributed 5,000.** A leading southern oil refinery **handed out 5,000.**

This is Your Big Opportunity!

I need **60 additional men right now!** Get into my successful selling organization. No collections. No deliveries. I go the limit in helping my salesmen. Furnish them with free literature. Back their efforts with high-powered sales letters. Furnish free sketches and ideas to help land big contracts. **This hearty team-work pays!** Again, I say, this is your big opportunity. Grasp it. Get my proposition. Drop me a line **now**—address **C. R. Coppock, Sales Mgr.**

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IT'S so easy to learn to play the famous KING saxophone! A few weeks' practice and you can play popular music—then join a band or orchestra and make good money playing for dances and other entertainments.

"KING" Band Instruments and Saxophones are easiest to play because they are built acoustically correct. Scientific design, finest skilled workmanship, careful supervision at each phase of construction make "KINGS" the most perfect instruments in the world. The tone quality is impossible to duplicate. Leading bands and orchestras insist upon "KINGS." Let us send you one for 10 days free trial.

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Any Diamond sent for absolutely free examination at our risk. No obligation. No cost to you. **Latest Listings—Unpaid Loans. Sent Free.** Describes Diamond Bargains in Detail, gives cash loan values guaranteed. Explains unlimited exchange privilege. **Write Today for your copy of Diamond Bargain List.** Postal card will do.

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Amazing Invention Does Away With Coal and Wood

Twice the Heat at Half the Cost—On or Off with the Turn of a Valve.

Think of having **instantly all the heat you want IN ANY STOVE** without building fires; without kindling, ashes, dirt, or odors. Think of having—**at the touch of a finger**—a fire that is three times hotter than coal—or just enough to simmer a kettle. A fire that **stays** where you want it—high or low.

THREE TIMES HOTTER THAN COAL

Think of the wonderful cooking and baking you can do with such a fire, think of the better health and comfort the family will enjoy when you can keep every room in your home at just the heat you want, warm and cozy, **day and night, in any weather.** These are but a few of the advantages enjoyed by users of a remarkable new invention—

INSTANT-GAS—CHEAPER THAN COAL

A scientific combination of 96% superheated air and 4% kerosene (common coal oil)—the cheapest and safest fuel known. It is produced by an amazing invention which, **in one minute**, can be slipped into the fire-box of any coal or wood stove. All the convenience of gas at half the cost.

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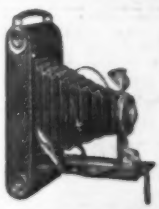

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No Experience Necessary—200% Profit

Make as much money next week as these men are making now. J. C. Lewis, of Kansas, says: **"I have sold one hundred sharpeners in four days."** Hobart Kerr, of Md., writes: "The women can hardly wait till they get them." Herbert Cain, of Ky., sold nine after supper. At the end of the first day, J. W. Gordon, of Pa., writes: "I sold two dozen and **I sold to every one I saw."** Wm. G. Hall, of N. J., says: "I think it is great. I sold six in about one-half hour. The machine is a mighty fine proposition. **I am a mechanic and I know what I am talking about." You can make this money. WRITE TODAY. TERRITORY FREE. Get busy at once.**

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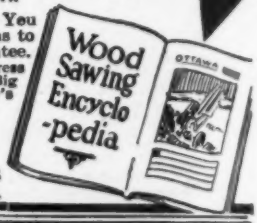

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$245 9 in. lathe—2½ ft. bed—with bench legs.

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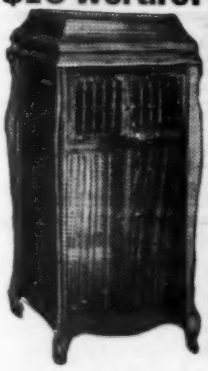

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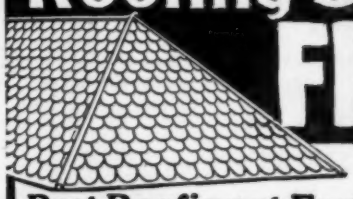

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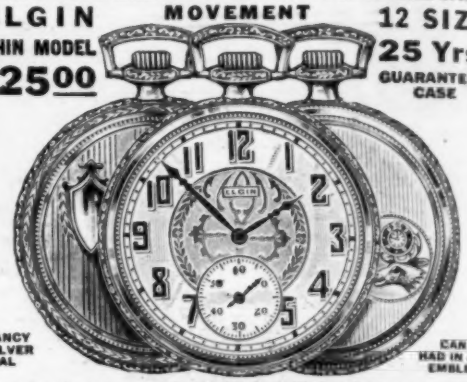

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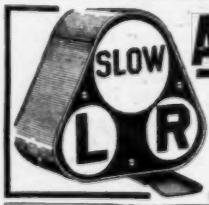

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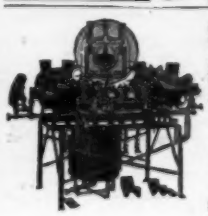

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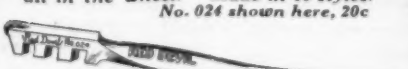

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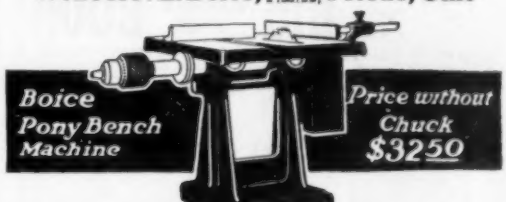

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Loftis Carved "PERFECTION" Diamond Ring Blue white, perfect cut Diamond **$75**

"No. 1 Special" Diamond Ring Brilliant Diamond, blue white and perfect cut. Ring is 18-k Solid White Gold **$50**

Terms: $5.00 Down, **$1.25** a Week

Loftis Carved "Perfection" Ring is 14-k Solid Green Gold. Diamond set in White Gold prongs. Bridal Blossom design. Special at **$75** Terms: $7.50 with order or on delivery, then **$2.00** a week until paid. Also up to $2,500. Wedding Rings to match.

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FOR CHRISTMAS GIFTS
Send for Catalog

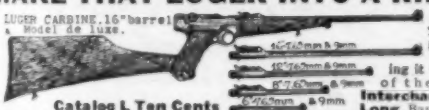
Over 2,000 illustrations of Diamond-set Jewelry, Watches, Wrist Watches, Pearls, Mesh Bags, Silverware, etc.—gifts by which you will always be remembered. Select as many articles as you wish and have all charged in one account. Sent prepaid for your Free Examination. **Send for Catalog.**

Rectangular Wrist Watch 18-k White Gold. 17 Jewels, $35; 14-k, 15 Jewels, $29. Yours for $3.50 down, then **$1.00** a Week until paid.

Money Back If not Satisfied
LOFTIS BROS. & CO.
National Jewelers
DEPT. G-894
108 N. State St., Chicago, Ill.
Stores in Leading Cities

17 Jewel ELGIN No. 15—Green Gold, engraved, assorted patterns, guaranteed 25 years. 12 Size, gilt dial **$32** Terms: $3.25 Down, then **$1.00** a Week.

MAKE THAT LUGER INTO A RIFLE!



Mail us your Luger for equipping it with any of the above **Interchangeable Long** Barrels with

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880 yard sight. Free labor. Shoot 200 accurate shots per minute with our 32-shot magazines and holster-stocks, equalling 8 riflemen. World famous V. Chr. Schilling super-accurate Mausers; Mannlicher sporters and other ultra-modern arms. **Pacific Arms Corporation, Liberty Bank Bldg., San Francisco, U.S.A.**

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J. D. Cooper says their Cadillac Car ran 30,000 miles without changing a tire after equipping with a new puncture proof tube, invented by G. B. MILBURN, 339 W. 47th Street, Chicago, Ill. This wonderful tube in actual test has stood

500 NAIL HOLES WITHOUT LOSS OF AIR

and it costs no more than ordinary tubes. Mr. Milburn wants distributors. You can become his salesman. Write to-day.

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300 Candle Power FARM LANTERN

The world's greatest contribution to light is the New Improved Wizard Gasoline or Kerosene Table Lamp, equipped with automatic cleaning needle. The discovery of "Thena" metal, used exclusively in Wizard Lamps and Lanterns, has revolutionized this industry. **Now** 10c worth of kerosene or gasoline will give 30 hours' pure white, soft yet intensely brilliant light. To introduce this remarkable lamp, we give absolutely **FREE** a genuine $8.50 Wizard Gasoline or Kerosene Lantern with the purchase of one lamp. But you must act **quick.** Offer limited to 5000 **Free Lanterns.** Write at once for **Free** book showing style of lamp you like and details of **Free Offer.** No obligation. Write **now. Agents** send for unusual offer and exclusive proposition.

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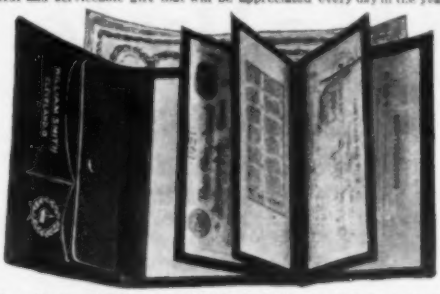
Send No Money

8-Window Pass Case, Card Case and Billfold

Be up to the minute. Carry all of your passes, lodge receipts, membership cards, loose change, bills, memos, etc., in the best-looking and most practical card case on the market.

Give a Card Case For Xmas

You can bring real happiness and joy to your friends at Christmas time by presenting them with one of these handsome combination card cases. A useful and serviceable gift that will be appreciated every day in the year.



A combination Card Case and Bill Fold made of **Genuine High Grade Leather** in a Winston Grain. It has eight windows for passes and membership cards, one full-size card pocket, two smaller pockets for stamps, car tickets, etc., one change pocket fastened with snap fastener and one large pocket in back for bills. All pockets are lined. Turned edges hand tooled. Size closed, 3½x4 5-8 in.

GOLD ENGRAVING FREE

We engrave your name, address (two lines) and Lodge Emblem in 23-carat gold, absolutely free. This work alone is worth $1.50. The engraving gives the card case a very classy appearance and will be the means of identifying it if lost or stolen.

CHINESE LUCKY RING FREE

We want every one of our customers to have the best of luck and just to liven things up a bit we will include with every card case sold one of these Chinese Good Luck Rings. A platinoid ring with heavy black enameled top and embossed Chinese lettering in white, meaning "Good Luck." This ring is said to be almost uncanny in its power to bring "Good Luck," Health, Riches, and Happiness. Marvelous stories of good fortune are told by its wearers. It's the last word in Novelty Rings. It sells for $1.50, but we give it to you absolutely free of charge when you purchase a card case.

Eight window combination card case, value	**$5.00**
Gold stamping, name, town, state, and lodge emblem	**1.50**
Chinese Lucky Ring (FREE)	**1.50**
	Value $8.00

ALL FOR ONLY - - $2.90 If You Act at Once

SEND NO MONEY

You surely must have one of these card cases, and also the free Chinese ring. Remember, we do not ask for one penny in advance. Just fill out the coupon and pay the postman $2.90 plus a few cents for postage when the package is delivered. We guarantee absolute satisfaction or your money refunded without question. You risk nothing. Send the coupon today.

M. P. REDINS MFG. CO., 6046 Superior Ave., Cleveland, Ohio

Send me the **Genuine Leather** combination card case shown above with my name, town, state and lodge emblem in gold engraved absolutely free. Also include a Chinese Lucky Ring free. When the package arrives I will pay the postman $2.90 plus a few cents to cover postage. If I am not fully satisfied, I will immediately return the case and the ring and you will refund my money.

Name.....

Street No.....

City.....State.....

Emblem Wanted.....

We do not send C.O.D. outside of United States

BOYS and GIRLS— Earn Xmas Money

Write for **50** Sets **Yankee Christmas Seals.** Sell for **10c** a set. When sold send us **$3.00** and keep **$2.00. No Work—Just Fun!**
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Noiseless and Indestructible

A new battery charger for Radio "A" (6 volt) batteries. Entirely noiseless. Has no moving parts, requires no attention or adjustment, and cannot get out of order. Simple and unfailing in action. Can be used while the radio set is in operation. A positive economical charger for home use. Can also be used to charge automobile batteries. Write for folder giving full description.

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Radio Frequency — Amplifying-Transformers

United Radio Frequency Transformer and Socket Combined

$3.50

United Radio Frequency Transformer

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Radio Frequency is becoming more and more popular. The New United Transformers have been designed to eliminate all capacity effects. The Unit Transformer is mounted in the base of the socket. This unit permits short leads —two or more units can be placed together.

Type R-1 is designed for either panel or table, or socket mounting.

Exceptional results can be obtained in any standard Radio Frequency. Reflex, Inverse Duplex, or Neutrodyne circuits.

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Will It Hit Your Aerial Next?
Protect Your Radio, Your Home, Your Life.

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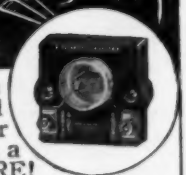
Radio Protectors



Model R-73 Lightning Arrester **$1.25**

What if lightning hits your aerial, or a wind or sleet storm brings your aerial into contact with a power-light circuit? FIRE! Not only destruction of your radio, but FIRE!

Approved by Fire Underwriters

Only COOK PROTECTORS give absolute protection. Approved by National Board of Underwriters. Both types made in dark brown porcelain with accurate air gap dischargers. The R-73 has, in addition, a fuse to protect receiving set from low potential currents and knife cut-out switch — **being the acme of protection.**

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Model R-73 Lightning Protector Fuse and Knife Switch **$2.50**

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Indispensable in the Home, Garage and to the Electrician. For soldering Radio, House Wiring, Jewelry, Ignition, Kitchen Utensils, etc.

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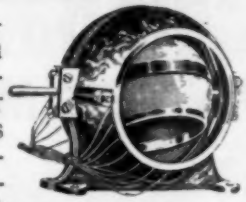
The first impression you get from looking at Pioneer Variocouplers and Variometers is that beyond doubt they are the most beautiful instruments yet devised.



"Pioneer" Variocoupler
$7.00

The beautiful Bakelite in a grained mahogany finish has a richness that has never been equalled before.

The heavy copper wire, covered with green silk, gives a contrast that makes the instrument irresistible and adds tremendously to the beauty of any set.

The mechanical parts are no less wonderful. The hardware of heavy bronze—the close-coupled rotor and stator—the positive contacts, all demonstrate the highest mechanical skill and attention to detail.

A special feature is the winding of the variocoupler on the inside of the shell—which is original and exclusive with Pioneer.

Pioneer Variocouplers $7.00
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Ask your dealer to show you these instruments. If he cannot supply you, write us, giving his name and address.

PIONEER RADIO CORPORATION
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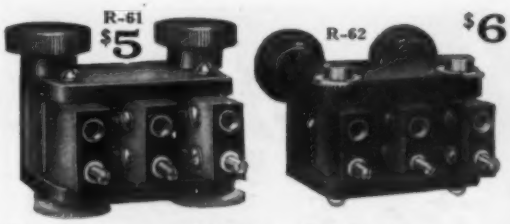

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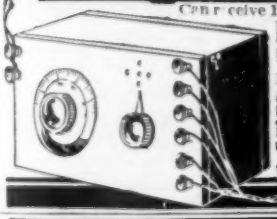

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"Safe as a Candle"

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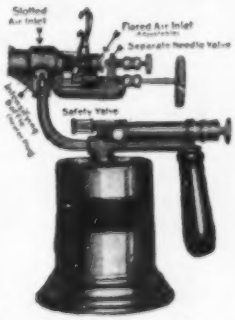

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The World's Largest Exclusive Manufacturers of Blow Torches, Fire Pots and Brazers.

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THE TRINITY LOUD SPEAKER

The only device of its kind in the radio field.

TYPE B $12.50

Study the illustration carefully and you will understand why it produces full, clear natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph or built into your set.

Type A1, $25.00
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Simplify the most complicated radio hook-up

Tell at a glance whether it is Antennae, Ground, Fones, A or B battery, etc. Name neatly engraved *for keeps* on top of each post. (See illustration.)

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The irremovable knobs save time, trouble, and petty annoyances. "Read'ems" add to the appearance of any set. Don't be without them. Price 15c each. Set of ten, $1.50. If your dealer can't supply you with "Read'ems" order direct. *Look for the name "Read'em" on every post*

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Ace Type V ARMSTRONG REGENERATIVE RECEIVER

$20

Licensed under Armstrong U. S. Patent No. 1,113,149

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RADIO "A" & "B" & AUTO STORAGE BATTERIES Overnight For Few Cents From Any 110 Volt A.C. Lamp Socket COMPLETE PORTABLE AUTOMATIC. No Skill Required. Screw Plug In Lamp Socket; Snap Clips On Battery Terminals Turn Switch & Battery Is Charged In Morning. Batteries Last Longer. Charger Lasts Lifetime. 5 Types. POPULAR PRICES.

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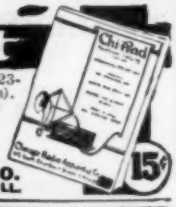
How to Build *the* Cockaday Set



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Weighs only 35 ounces. Can be **used in any position.** Can be **held at any angle.** Won't leak. No soldered joints to melt. Fits into tool kit easily. **Uses low grade gasoline.** A bonanza for the plumber, painter, electrician, battery man, radio fan, mechanic, lineman or anyone who uses a torch. Wonderful for household use. Pressure can be generated within 15 seconds by laying torch on open flame. This not possible with any other torch. The DOWNEY TORCH also has self-generating device, **is always ready.** Simply heat, turn valve and light. Frozen pipes instantly thawed. **Convenient to use in inaccessible places.** Radio fans are wild about the DOWNEY BLOW TORCH.

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Name.....

Address.....
My dealer's
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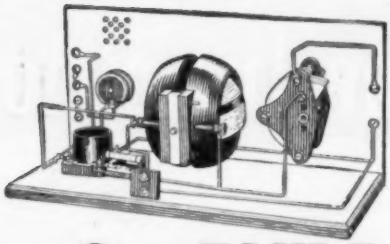
Check here [....] if circular only is wanted.



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STANDARD SINCE 1904

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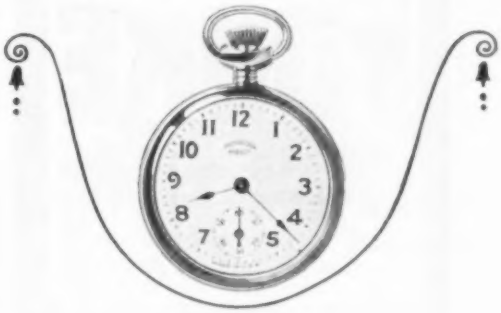

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In the state of Ohio there lived a bunch of boys who had this trapping business down to a science. They each sent for separate price lists every year and then sent all their furs to the house giving the best quotations. After five years they decided they weren't so dreadfully wise because they didn't have enough profits to make their efforts worth while.

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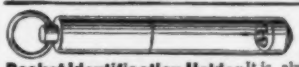

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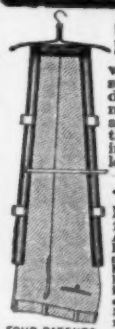

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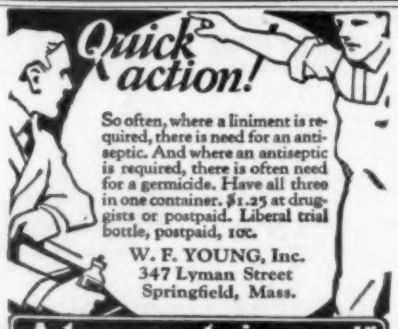

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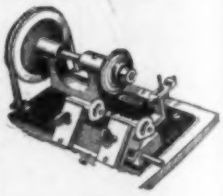

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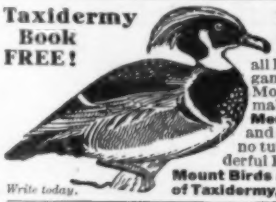

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is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities.

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SPECIAL OFFER ONLY WHILE 200 LAST. READ DETAILS BELOW

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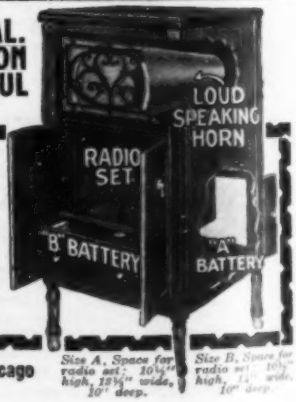

Size A, Space for radio set: 10½" high, 13½" wide, 10" deep. *Size B, Space for radio set: 10½" high, 14" wide, 10" deep.*

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Detroit Belt Lacer Co., Detroit, Mich.

Rings Bells Without Batteries

Avoid the annoyance of having bells out of order. At a nominal cost you can install this little device which will ring electric bells, buzzers, annunciators, electric heat regulators, door-openers, etc., from the same current that lights your home.

ONLY $2.00 Canada $3.00

The Air-Way Bell Ringer Transformer

Connects direct to lighting-current, and eliminates forever the use of troublesome dry batteries. Does not use enough current to register on meter. Buy it from any electrical dealer, or we will send it anywhere postpaid upon receipt of price. Your money back if you are not satisfied.

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BE COMFORTABLE—Wear the Brooks Appliance, the modern scientific invention which gives rupture sufferers immediate relief. It has no obnoxious springs or pads. Automatic Air Cushions bind and draw together the broken parts. No salves or plasters. Durable. Cheap. Sent on trial to prove its worth. Never on sale in stores as every Appliance is made to order, the proper size and shape of Air Cushion depending on the nature of each case. Beware of imitations. Look for trademark bearing portrait and signature of C. E. Brooks which appears on every Appliance. None other genuine. Full information and booklet sent free in plain, sealed envelope.

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Adjusted to the Second
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21 Ruby and Sapphire Jewels
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Your Choice of Dials (Including Montgomery R. R. Dial)
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Only One Dollar Down will buy this masterpiece of watch manufacture. The balance you are allowed to pay in small, easy, monthly payments. The Burlington—a 21-Jewel Watch—is sold to you at a price much lower than that of other high-grade watches. Besides, you have the selection of the finest thin model designs and latest styles in watch cases. Don't delay! Write for the FREE Watch Book and our SPECIAL OFFER today.

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Burlington Watch Company
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Finest American Make Watch ($20 Value) at amazing reduction. Excellent timekeeper. **Mechanically perfect.** Stem wind & set. Designed to give years of service. **Buy direct. Save over 50 per cent.** Examine first.

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Beautiful thin vest model. Case stamped **25 yrs. Guaranteed Genuine 14 Kt. Gold** Filled. 7 Jewel fully adjusted movement. **Not an ordinary watch!**

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NEW LAMP BURNS 94% AIR

Beats Electric or Gas

A new oil lamp that gives an amazingly brilliant, soft, white light, even better than gas or electricity, has been tested by the U. S. Government and 35 leading universities and found to be superior to 10 ordinary oil lamps. It burns without odor, smoke or noise—no pumping up, is simple, clean, safe. Burns 94% air and 6% common kerosene (coal oil).

The inventor, H. E. Johnson, 609 W. Lake St., Chicago, Ill., is offering to send a lamp on 10 days' FREE trial, or even to give one FREE to the first user in each locality who will help him introduce it. Write him to-day for full particulars. Also ask him to explain how you can get the agency, and without experience or money make $250 to $500 per month.

This Palatial Florida Home

can be purchased at a very reasonable price. It is the finest estate in a community of 30,000 situated amid 5 acres of orange, grape fruit, sweet bay, palmetto and a large variety of semi-tropical trees and foliage. A water front of 400 feet, with entrance from a Boulevard, affording every modern convenience. House recently completed and never occupied. Has every modern improvement, large sun parlors, sleeping porches and 8 bath rooms. Inexhaustible supply of soft water, steam heat, high, light basement under entire house. Surf bathing all winter within 5 minutes' walk.

For full details, photographs and price address

OWNER,
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New Kind of Light
—Brighter than 20 Ordinary Lamps

New Bright White Light For Every Home

Wonderful Invention

I have made it easy for every home to have bright, cheery, healthful light—in cities, villages and on farms—anywhere—at a price all can afford. No more need you put up with the dingy, smoky, foul-smelling oil wick lamps and lanterns. No more need you put up with the drudgery of cleaning and trimming greasy, dirty wicks and chimneys. For less cost than you would pay for a good oil lamp you can have an abundance of brilliant, white light—20 times brighter—for every room in the home or for outdoor chores.

Write Me Quickly

Let me send you complete particulars and information together with my amazing special introductory offer. My wonderful invention is the sensation of the age. Each Lamp and Lantern is a complete gas generating unit in itself—light in weight—easily carried, safe, convenient, easy to operate. Table Lamps, Hanging Lamps, Wall Lamps for every lighting purpose, also most durable, certain outdoor Lantern ever made. Wind-proof, storm-proof, bug-proof. Costs only half as much as wick lamps or lanterns to operate.

300 Candle Power

Think of the difference. Ordinary wick lamps give 5 to 10 candle power of light. My invention gives 300 Candle Power —beats electricity or gas for economy, brightness and quality of light. **Burns 96% Air**—Only 4% cheap gasoline or kerosene (coal-oil). Produces a light bright as daylight. Soft, mellow, easy on the eyes. Lights with match as quickly and easily as old-style lamp. Simple to operate and positively safe. Greatest advancement in home and farm lighting in a century.

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I want to put at least one of these Lamps or Lanterns in every home. I am making a sensational introductory offer to do it. I back it with my 30-day trial guarantee. You try it without a penny of risk. I take all the responsibility. The coupon, a letter or post card brings this offer and big attractive, descriptive catalog FREE, from which you can select any one of the many handsome designs. Be first in your locality to write and get this liberal money-saving introductory offer. Send your name and address today.

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"INVINCIBLE" Rebuilt GUARANTEED STANDARD No. 10 Self Starter Model REMINGTON $43.75

Try it in your own home or office before you pay a cent. Looks and writes like new. Has full 84 character keyboard, standard size type, back spacer, automatic ribbon reverse and all other late improvements. A real bargain. All standard makes. Deliveries from nearest of our 28 stores. Send TODAY or write for circular. Time payments at slightly higher price. Resident salesmen wanted.

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Our marvellous, practical **Movie Machines** sell as low as $5.00—and what's more, we have wonderful films at lowest prices—with a new film rental service. DON'T MISS THIS!

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want agents to sell advertised brand all wool tailored to measure suits and overcoats direct to wearer. Lowest prices, sell on sight. No capital or experience required. Big line, swatch samples free. Biggest commissions paid daily.

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MAKE YOUR FORD INTO THIS SPORT CAR—SAVE $50 to $150 WITH Red-i-Kut Life-Size Patterns $6.40 COMPLETE

Easy-to-Understand Instructions and Tail Delivered

Famous Red-i-Kut life-size patterns and picture-fit ture instructions show you how you can easily convert your Ford into this **Fast, Snappy, Sport** Car as thousands have done, with easily obtained materials. No head to lay up the car. **LOOK AT WILFRED ENO'S PAL.** Eno says, "*Total material cost with steel and paint for my Pal only $115.51. It took me just 3 Sundays to build it and I sure am proud to keep them say. 'He built that snappy sport car.' I never cut any steel or did any woodwork before but one can't go wrong with Kuempel patterns.*" (Overland City) St. Louis, Mo. The **"Pal"** with **pressed metal streamline rear, life-size patterns for each part of the body so you can't go wrong, picture instructions and**

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Only $6.40 delivered. Order now while we can make good delivery, and really enjoy these wonderful days in your **"Pal." Keen, Classy, Up-to-the-minute. You can build it. Over 11,000 in use. Don't hesitate. "Swing Lo" Undercling irons, no frame cutting kind,** only **$7.81.** *Send 5c coin for new manual of other distinctive sport body patterns from $2.80 up —"RKO" Steel "Swing-Lo" Irons, "Jiffy" Tops and "Gosum" Windshields. Order Right Now.* **Kuempel Co., 43 Kuempel Bldg., Guttenberg, Iowa**

38-inch, Easy-riding seat

Genuine KEYSTONE MOVIEGRAPH

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SHOWS BIG SIZE MOVING PICTURES

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Reel of Charlie Chaplin—"The Kid"

The following reels are only a few in the film catalogue, that is furnished with the machine and are genuine, posed by the actors themselves. The film is the same size as used in the theatre.

1 Reel Charlie Chaplin in "Fun in the Bakeshop"
1 " Wm. S. Hart in "The New Sheriff"
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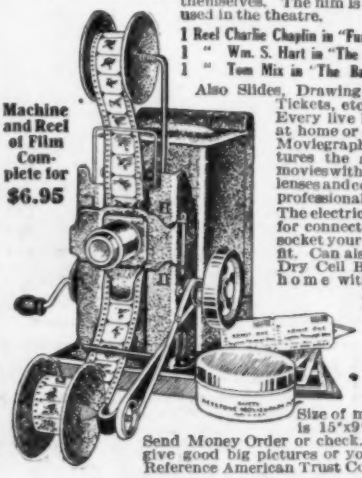
Also Slides, Drawing Slides, Theatre Tickets, etc., included.



Machine and Reel of Film Complete for $6.95

Every live boy should have at home or club a Keystone Moviegraph that shows pictures the same as in the movies with powerful French lenses and constructed along professional lines.

The electric cord is included for connecting to any lamp socket your electric bulb will fit. Can also be had for any Dry Cell Batteries for the home without electricity.

Nothing to get out of order. No complicated parts.

We have the largest comedy film service in the country for home machines.

Size of machine all set up is 15"x9". Weight 3 lbs.

Send Money Order or check. Guaranteed to give good big pictures or your money back. Reference American Trust Co., Boston, Mass.

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Projects a better, clearer, more direct light exactly where you need it—in home, office, store, studio, workshop. Solid brass; a quality product throughout. Clamp is felt-lined — can't scratch. 5-year guarantee. Complete with 8-ft. cord and 2-piece standard plug. For sale by live dealers everywhere.

If your dealer cannot supply you, order direct.

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Prices in U. S. A. and Canada: brass, $5; bronze, nickel or white enamel finish, $5.50. West of Miss. River 25c higher.

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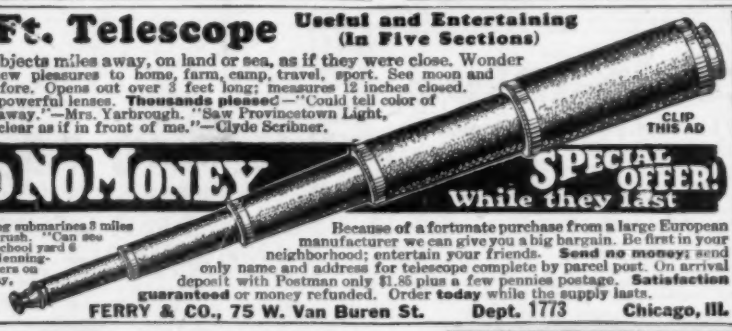
Useful and Entertaining (In Five Sections)

See people and objects miles away, on land or sea, as if they were close. Wonder Telescope gives new pleasures to home, farm, camp, travel, sport. See moon and stars as never before. Opens out over 3 feet long; measures 12 inches closed. Brass bound; has powerful lenses. **Thousands pleased**—"Could tell color of aeroplane 4 miles away."—Mrs. Yarbrough. "Saw Provincetown Light, 28 miles away, as clear as if in front of me."—Clyde Scribner.



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$20 Monthly Brings Big Battery Charging Profits

EVERY SHOP now can have **big profits from 8-hour battery charging.** Small cash payment puts HB Constant Potential Outfit in your shop. **Your increased profits easily carry the small $20 monthly terms,** with good surplus besides. Improved HB 8-hour service builds trade, beats competition. An HB saves you $35 to $115 over any other outfit on purchase price alone.

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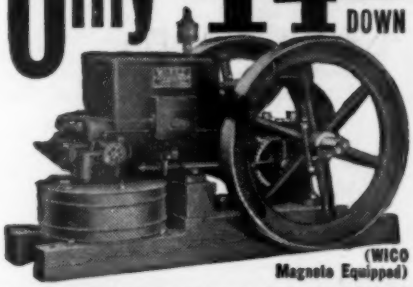
Pays For Itself ~ Earns Big Profits

Only $14.24 DOWN



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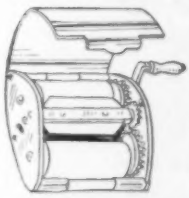

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Rollers move laterally from right to left. Perfect action! Perfect stropping! Keeps blades always sharp. GUARANTEED.

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The Newest Simore Tool

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Combination **Knife** and screwdriver—a keen steel knife blade, and two screwdriver blades in the handle. All blades selected and produced by gravity; the knife blade can never fold or turn and injure you; change blades in two seconds.

$2.25 Prepaid

This combination **Knife** and screwdriver will be sent to you post prepaid for only **$2.25**, check or money order. The only tool of its kind, an ideal Christmas gift for radio fans, carpenters, motorists, boy scouts, and for household use. Order today.

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$1.00 Brings You Any of these Beautiful Xmas Gifts

Biggest Xmas offer ever made! Send a Dollar—mention gift desired. That's all! We ship at once! If satisfied pay 10% monthly. Otherwise return and we refund deposit. Rush your Dollar TO-DAY!

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X6—Genuine hand carved cameo solid gold ring $15.

X7—7 diamond cluster platinum set solid gold belcher mounting $52.50.

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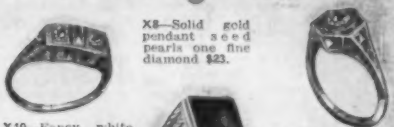

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$365.75 ONE DAY

Ira Shook of Flint Did That Amount of Business in One Day

—making and selling Popcorn Crispettes with this outfit. Profits about **$269.** Bram bought first outfit Apr. 5, 1923 and **7 more outfits** by Aug. 28, 1923. Iwata, Cal., bought one outfit, then **10 more** within a year. Mrs. Lane of Pittsburg says, "Sold **8000 packages** in **one day** (1923)". J. R. Bert, Ala. wrote, "Only thing I ever bought that equalled advertisement" J. M. Patillo, Ocala, writes, "Enclosed find draft to pay all my notes. **Getting along fine.** Crispettes all you claim and then some." John W. Culp, So. Car., writes, "Everything going lovely. Crispette wrappers lying all over town. It's a good old world after all." **Kellog $700 ahead** end of second week. Mesner, of Baltimore, **$250 in one day.** Baker sold **3,000 packages in one day.** Perrin, **$380** in one day.

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Furnish secret formulas, raw material, and equipment. Very little capital required; no experience needed.

Build a Business of Your Own

There is no limit to the sale of Crispettes. Everybody likes them. It's a delicious food confection made with or without sugar. Write me for facts about a business that will make you independent. Start now, in your own town.

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Send postal for illustrated book of facts. It contains enthusiastic letters from others—shows their places of business, tells how and when to start, and all information needed. Free. Write now!

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Completely wired, including glassware. New designs. Send for catalogue No 24. Send for DEALERS' proposition.

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You are not asked to purchase this remarkable invention until you have tried it 10 days FREE, until you have proved to your entire satisfaction that it is what you need and want—until you are absolutely certain that it will enable you to hear all sounds clearly. Then, if you wish, you may keep and pay for it, otherwise return it and there will be no charge.

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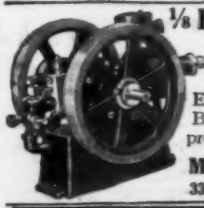

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Remove Shade for Outdoor Use — 300 Candle Power

A FLOOD OF LIGHT Burns 97% Air

This great 2-in-1 (lamp and lantern) solves the lighting problem for millions who want a light brighter than gas or electricity. Requires no wiring or piping. Lights with matches. Smokeless, compact, handsomely nickeled. Durable, economical—burns 97% air.

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and if your friends or even you yourself can tell it from a genuine diamond, **send it back.** "*Rabon*" diamonds look exactly like genuine, place a "*Rabon*" and a genuine diamond together, see if you can tell them apart. They have the same fiery blue white appearance as the genuine diamond, the same sparkling dazzling, rainbow brilliancy and are actually alive with fire. "*Rabon*" diamonds almost defy the life time diamond expert. Neither science nor man has ever created anything more realistic. Give "*Rabon*" the same test you would a genuine diamond. Prove to yourself its amazing qualities.

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Mountings are exact duplicates of latest style original genuine creations. Unconditionally guaranteed for twenty years.

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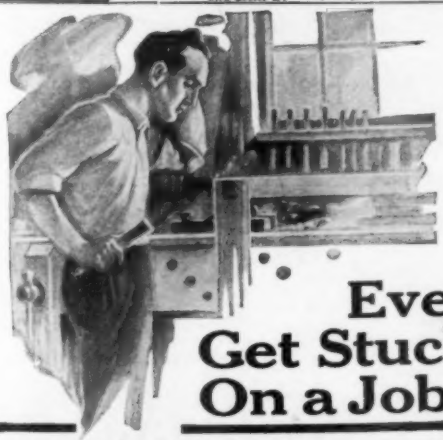

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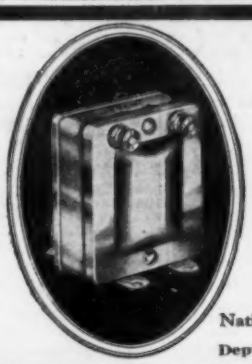

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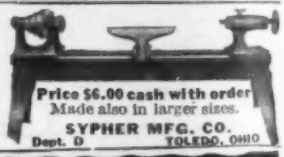

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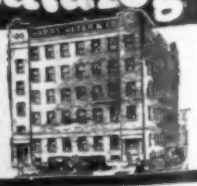

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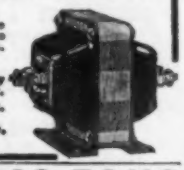

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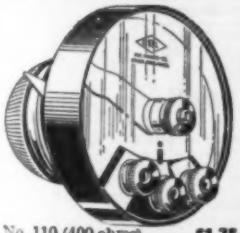

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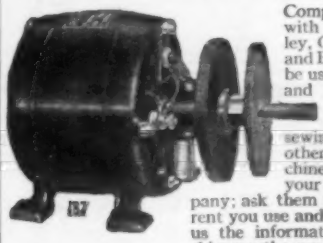

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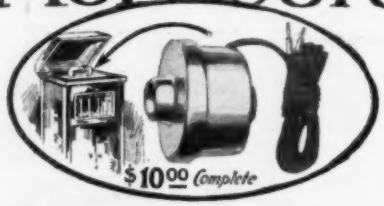

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FREE Catalog Always holds shape. Most customers get from 3 to 5 years wear easily. Can endure severe wear and retain bright, fresh appearance. Biggest values in history. Workmanship guaranteed. Prices slashed. Unusual chance to save. Special offers to schools, clubs, teams. Write for free illustrated catalog.

AMERICAN KNITTING MILLS 1536 Clybourn Avenue Dept. 16 CHICAGO

$4.00 High Grade Head Set $4.00

Radio Cabinets Phonograph Cabinets and Parts

LAKESIDE SUPPLY CO.
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Vacuum Tubes Repaired

SAVE AT LEAST ½ THE COST OF NEW
UV200 and UV201 ..... $2.75 each
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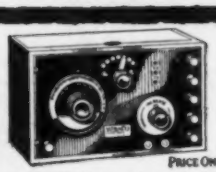
GUARANTEED EQUAL TO NEW

Opportunity for boys to make big money by collecting tubes in quantities.

All tubes received and returned parcel post, C. O. D.

HARVARD RADIO LABORATORIES
200 & 204 Old Colony Ave., So. Boston, Mass.



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Mrs. Wildt made $2,000.00 with hens in twelve months. All simple and easy. The book is FREE. Write at once. If you enclose 25c we will send you 25 colored leg bands to mark your best layers. *Mention breed of hens.*

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Oil solves the heating problem

Oil is heir! Oil is not only the present bone of contentment but it is the means of content to many a home where coal has become impossible to get, either on account of lack of supply or due to the high prices. Now King Oil is at your service for heating your house or cooking your meals!

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converts any cook stove or heater into a real gas stove. Oxo-Gas made from kerosene and air is cheaper, cleaner and more efficient than coal. Send for catalog illustrating Oxo-Gas appliances for all purposes where coal is used. We have openings for General Sales Managers and distributors. Only those who can finance themselves considered.

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"I WAS AMAZED by the wonderful FARMING OPPORTUNITIES in Canada"—

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$20.00 Per Acre Average Price

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There are still good farms and millions of acres of fertile land to be had at very reasonable prices and terms. Others have gone to Canada on just such farm lands and with the same opportunities you'll find. They have prospered and gone ahead. Any man who investigates as this famous Editor did is equally strong in praising Canada's farm opportunities. It's not too late for you to share in the prosperity to come. Canada's 1923 wheat crop broke all previous records. One-fifth of the world's wheat supply is produced by just a few thousand Canadian Farmers!

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Special Excursion Rates

Reduced railway fares are in effect for landseekers and their effects to encourage inspection along the lines of the Canadian National Railways. Personally conducted excursions will also be arranged.

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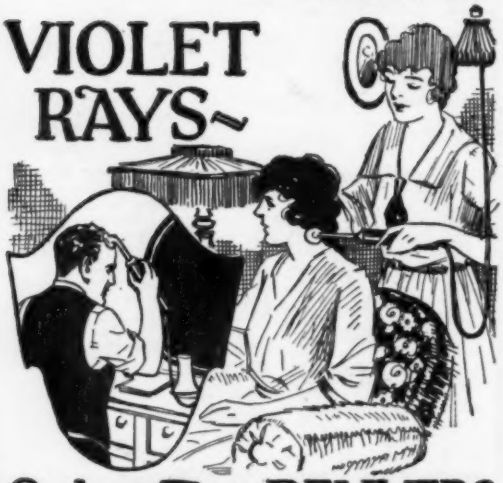

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ONLY $1.00 brings this complete, scientific Violet Rays outfit to you. Treat yourself and family at home, save delay, costly doctors and medicines. Thousands use Violet Rays at home to relieve pain and sickness. The identical outfits doctors have bought from us for years and with which they successfully treat many ailments.

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Violet Rays work quickly, it's scientific, goes after the cause. That's why results are quick, permanent. Dr. Duncan, Kewanee, Ill. writes, "Violet Rays is the finest thing I ever used . . . . to relieve pain, treatments are so pleasant all my patients like it." Use it yourself at home, you save Doctor's bills.

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Brings natural, magnetic beauty of health, no dieting, exercise or drugs. FREE book tells in detail how high priced beauty specialists use it to improve scalp and skin.

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Men, women, without experience earn liberal profits in spare time showing Violet Rays to neighbors. Proves results first demonstration. Sells on sight. Get attractive offer and wholesale prices now.

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Explains how Nikola Telsa discovered Violet Rays, how it works, why it heals. Tells what doctors and plain folks accomplish in conquering pain, disease and nervous trouble with Violet Rays.

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Please send me without cost or obligation your free book describing your VI-REX Violet Ray outfits, and details of your $1.00 offer.

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OUR MARVELOUS MEXICAN DIAMONDS

have delighted thousands of customers for 18 years. They positively **match genuine diamonds.** Same **perfect cut,** same **dazzling** play of **rainbow fire.** Stand intense acid test of **side by side comparison with genuine. Noted experts** positively need their experience to detect **any difference whatever.** Perhaps the gems you admire on your closest friends are **MEXICAN DIAMONDS** and you never knew it. **Test a MEXICAN DIAMOND FREE; you risk nothing.** Wear it seven days **side by side with a genuine diamond.** If you see **any** difference, **send it back; it won't cost you a cent.**

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To introduce to new customers, we quote these prices which are **all you pay** and **just half our catalog prices.**

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SEND NO MONEY Just send name, address and slip of paper that meets around ring finger to show size. Say which ring you want. We ship promptly. On arrival, deposit price with postman. If you decide not to keep it, return in 7 days and **we'll refund your money. Write TODAY.** Agents wanted.

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Exclusive Controllers of Mexican Diamonds for 18 years.

If Every Boy

who Loves to Fish and Camp, or is fond of the Water, will write to the

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He will receive something which cannot fail to interest him. A postal card will do.

$3 with the coupon

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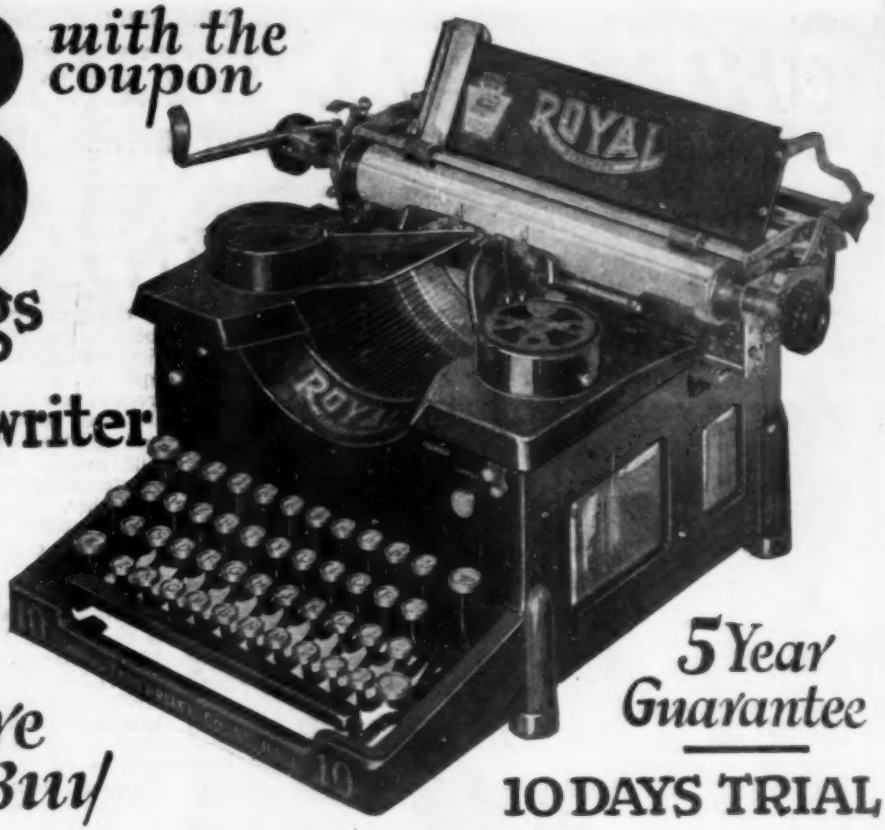

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Think of it! Your opportunity to secure this late model Royal No. 10 for only $3.00 down on the easiest terms ever offered. Simply send us the coupon and $3.00 and we will ship this typewriter subject to your approval. You then pay only $5.00 per month until our low direct from factory price, $53.00, has been paid when the machine becomes your property. Why pay rent when you can buy on such easy terms, have the use of the machine while you pay—besides you save more than half. We give you the same guarantee as if you paid the original factory price, $102.50. Our cash price is $47.70.

Every machine is completely RE-MANUFACTURED BY THE FAMOUS YOUNG PROCESS and fully guaranteed like new. All worn parts are replaced wherever a new part will make it a better machine. Completely re-enameled, re-nickeled—a perfect writing machine. You cannot tell it from a brand new Royal in appearance, service or workmanship. This beautiful typewriter comes to you with all the latest improvements such as two color ribbon, automatic ribbon reverse, backspacer, card writing attachment and forced alignment. Touch can be regulated by simple attachment, to suit you. Most complete visible writing, etc.

Ten Days' Free Trial

Send us your order today. We will ship one of these wonderful machines on ten days' free trial without obligation to buy unless you are satisfied in every way that this is the greatest typewriter bargain ever offered. The Royal features the beautiful writing quality—Compare it with any other machine—and you will know why hundreds of thousands have been sold. You do not buy until you have tried it. Let us prove what we say, and if you are not thoroughly satisfied you may return it at our expense. We are positive you cannot equal this wonderful typewriter value anywhere.

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You will perhaps never have as great a typewriter opportunity. There are only a limited number of these typewriters at our low factory price so rush your order. Simply send us $3 with the coupon and we will ship to you at once for full 10 days' free trial, or write us for our big free catalog of typewriter bargains all standard makes.

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☐ I am enclosing $3.00. Ship me the *Royal* typewriter, F. O. B. Chicago, as described in this advertisement, on 10 days' trial. If I decide to keep it, I will pay you promptly $5.00 monthly as rental for 10 months and the machine is mine. The title is to remain with you until all payments are made. If I choose not to keep it, I will carefully repack it and return it at your expense.

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UNLIKE ALL OTHERS!

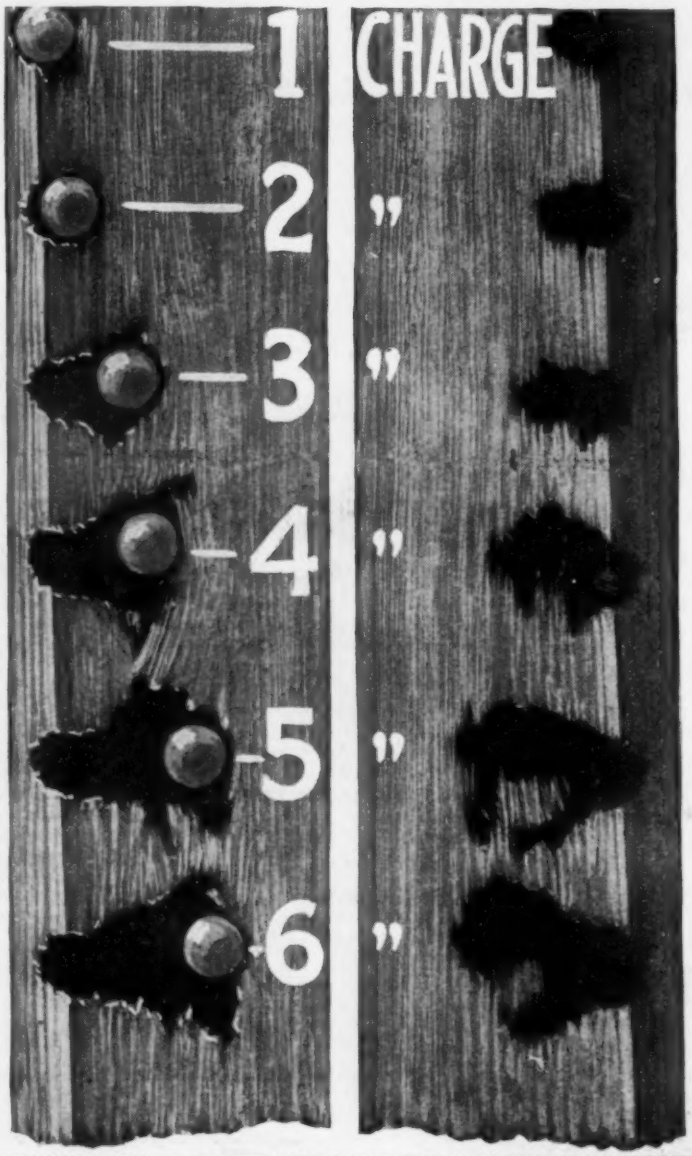
ONE TO SIX PUMP-STROKES COMPRESSES AIR TO ANY SHOOTING-FORCE DESIRED

Three Strokes for Ordinary Shooting

The BENJAMIN

This illustration shows an inch block of wood (double size) penetrated to different depths by a Benjamin Air Rifle using one to six charges of air.

This is a Feat No Other Air Rifle Can Duplicate



is the gun you have been looking for. For target practice and for hunting rabbits, squirrels, gophers, rats and frogs it has no equal. It is the most powerful, accurate and reliable compressed air rifle made. It has a far greater shooting range than any other. Imagine bringing down rabbits with an air rifle! You can do it with a Benjamin.

The BENJAMIN is the ONLY PUMP GUN MADE using compressed air. SIMILAR TO AIR DRILLS AND HAMMERS. It does not lose shooting force after long use. The BENJAMIN is the only air rifle with the shooting force under the operator's control. It can be loaded to shoot weak or powerful as desired, from one to six strokes of the pump giving all the power wanted. It is absolutely safe; accidental discharge is impossible. Furthermore, after being charged with air, it is ready for instant use at any time after the shot is placed in the barrel.

The BENJAMIN is mechanically perfect. It is the only air rifle not requiring frequent repairs, customary in all spring guns.

Price $5.00 Post-Paid

Write for descriptive folder giving full details of this wonderful air rifle.

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AIR RIFLE & MFG. CO.
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ST. LOUIS, MO., U. S. A.

Pacific Coast Representative
THAYER & BOWER
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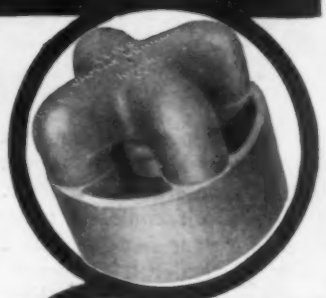
Salesmen Make $100 A DAY With New Fuel!

Amazing Invention Does Away With Dirty Coal and Wood!

Think of the appeal you can make to every man and woman using coal! No more fires to build, bank or watch—no more worries about coal shortages, poor quality or high prices since this wonderful New invention. No wonder Oliver Salesmen pile up such amazing records. Bentley's $215 profit in a single day, Ames's $279.65 in one day, Slade's $13,500 are only indications of what may be expected.



Slips right into any furnace without change. 2 times the heat of coal. No motors, gas or electricity.

At last, the device that American Householders have wanted for years has been perfected—a real efficient Oil-Burner for stoves and furnaces at a low price. Oliver salesmen are riding in on the tremendous sweep of sales and profits. $1,000 a month is not an uncommon thing. No wonder—think of what this wonderful device means to every person now operating a coal stove or furnace!

Cheap, Clean, Odorless

They do away forever with coal — ashes — dirt — dust — soot — smoke—building fires —cleaning furnaces — carrying ashes — uneven heat—cold rooms—frozen pipes and plumbers' bills—coal shortages—poor quality and exorbitant prices. Banished!

2 Times the Heat of Coal

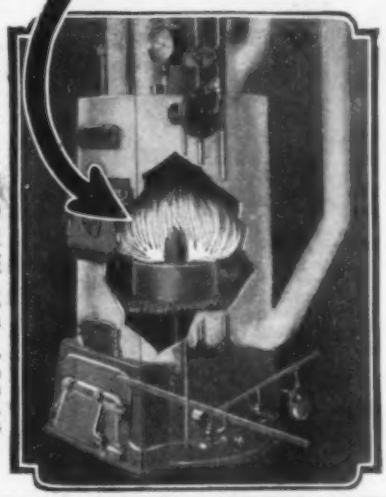
These extraordinary comforts and conveniences are only possible through the wonderful discovery by Mr. Oliver of a way to combine 95% air with 5% oil, the cheapest fuel there is. This forms a gas that burns with an intense, clean flame and gives **2 times the heat** of coal.

58 Regional Managers To Get Established National Business

A national Distributing Organization has been made necessary by the enormous growth of Oliver sales. Millions of dollars of established business will be transferred to 58 Regional Managers. In the next few months every home in America will be reached by advertising telling the story of Oliver Furnace and Stove Burners. Selling Organizations or Big Calibre men looking for a position that will net from $10,000 up to $100,000 a year should write or wire immediately to Mr. Oliver personally (address below) for full details of this plan.

Exclusive Territory Offer

You might as well be cashing in on the nation-wide sale of this invention. You might as well become an authorized Oliver agent, and have a steady money-making line as long as you live. This is one chance of a lifetime. You owe yourself this opportunity. The coupon below will tell you of the amazing features of the Oliver Burner. It will bring Mr. Oliver's liberal commission offer and tell you how you can get an exclusive territory. You must act quickly Mail the coupon at once. Do not delay a single day. Live salesmen recognize this unequalled opportunity for big profits. Territories are being snatched up. Act quick. Mail coupon immediately.



OLIVER OIL-GAS BURNER

OLIVER OIL-GAS BURNER CO.
2014-W Oliver Bldg., St. Louis, Mo.
Canadian Distributor: 2014-W Oliver Bldg., Toronto, Ont.

OLIVER OIL-GAS BURNER CO.
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Send me immediately complete details of your offer to prospective Oliver representatives including your free book, "New Kind of Heat," and full details of Exclusive Territory Franchise Offer. I am interested in proposition checked below.

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Address.....

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Spare Time Work Full Time Work Regional Distributor

The Proper Finish Will Make Your Furniture Harmonize

Small odd pieces of modern furniture add greatly to the attractiveness of every home. You, yourself, can easily make them for your family. There is no particular trick to constructing porch swings, tables, telephone sets, etc.

The furniture, woodwork and floors of your home can be made to harmonize if a little taste is used in finishing them. You can easily refinish dingy, shabby, scratched wood. Our method involves practically no expense. All you need is a little time—a brush—and **JOHNSON'S WOOD DYE.**

Johnson's Wood Dye is very easy to apply—it goes on easily and quickly, without a lap or a streak. It penetrates deeply, bringing out the beauty of the grain without raising it—dries in 4 hours and does not rub off or smudge.

Johnson's Wood Dye

FREE-This Book on Home Beautifying

This Book tells how to finish wood in artistic stained and enameled effects. Gives practical suggestions on making your home artistic, cheery and inviting. Tells just what materials to use and how to apply them. Includes color card—gives covering capacities, etc. Use coupon below.

S. C. JOHNSON & SON, P. A. 12
RACINE, WIS. (Canadian Factory—Brantford)

Please send me free and postpaid your Instruction Book on Home Beautifying and Wood Finishing.

The best dealer in paints here is.....

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MY NAME.....

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JOHNSON'S WOOD DYE has many uses, for both the artisan and amateur. *Architects and contractors* specify it for coloring woodwork and flooring in new buildings. *Painters and decorators* use it with equal satisfaction on new and old woodwork of all kinds. *Housewives* delight in it for doing over old furniture and for coloring reed and wicker baskets, etc.

JOHNSON'S WOOD DYE is made in fourteen standard shades—a few of which are:

129 Dark Mahogany	*126 Light Oak*
127 Brown Mahogany	*123 Dark Oak*
140 Early English	*110 Bog Oak*
131 Walnut	*124 Golden Oak*
125 Mission Oak	

All shades may be easily lightened, darkened or intermixed. Full directions on every label.

If you are building or remodeling you should have our book on Wood Finishing. It is chock full of valuable information. Tells just what materials to use and how to apply them. We will gladly send it free and postpaid. Use coupon at left.

FREE this beautiful pair of book-ends

This offer is made in order quickly to introduce a NEW Little Leather Library set of thirty world's masterpieces into a few thousand representative American homes. These Bas-Relief Lincoln Book-Ends will add grace to any library table; they are of heavy bronzed metal, antique finish; store price, from $1.00 to $1.50. Read below how and why, for a short period, you can obtain a pair for nothing.

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THERE never has been a finer Christmas gift than good books. They show what you think of the recipient; they show that you respect him as a person of culture; they show also your own appreciation of things worth while. They are acceptable by men, women, children. What then could be more suitable than to give this NEW set of 30 splendid Little Leather Library masterpieces to many of your friends? You can give the entire set to one person; or ten books to each of *three* persons; or five books to each of *six* persons. Or, if you please, you can send one book to each of *thirty* friends, *at no more cost than a good Christmas card!*

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No picture can do these handsome volumes justice. The paper is the same as that used in $1.50 books; *there are over 3,000 pages in the set;* the covers, while not leather, are made of a remarkable limp Croftcott, beautifully embossed. They look like hand-tooled leather.

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Profiting by last year's experience —when we were completely "sold out" long before Christmas—we prepared this year to supply 150,000 sets—*four and one-half million books!* We feel sure, accordingly, there will be enough sets on hand to supply the demand. Last-minute buyers may, however, again be disappointed. We urge you, therefore, to reserve *at once* as many sets as you desire. We will either ship direct to you, or to your friends, in time for Christmas, enclosing a Christmas card bearing your name.

Send No Money—Sent for Free Examination

Little Leather Library books can be found today in the finest homes in the land. If, however, because of the low price, you feel that these wonderful volumes are not attractive enough to keep in *your* home, or to present as a gift—we want you to have the evidence of your own eyes. Send the coupon, or a letter at once. When the package comes, give the postman only $2.98, plus the few cents for delivery charges. If you do not agree that this is the greatest book bargain of your life, send the set back and your money will be instantly refunded. (Reference, Manufacturers Trust Co., New York.) Note that with each set we are including for a limited time, a handsome pair of Lincoln Bas-Relief Book-Ends, free.

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354 Fourth Ave.,
New York City

Please send me..... new sets of 30 volumes of the Little Leather Library and a pair of Lincoln Bas-Relief Book-Ends free with each set. I will give the postman $2.98, plus the postage, upon delivery for each set. It is understood, however, that this is not to be considered as a purchase. I reserve the right to return the books any time within thirty days, and if I do so, you agree to return my money.

Name.....

Address.....

City.....State.....

NOTE: If shipment is to be made to friends enclose check or money order for proper amount and include names and addresses of friends. Add 30c for each set to cover delivery charges. Shipment will be made at Christmas time, each package containing a card bearing your name. (Outside of U. S. Price $3.50 Cash with order)

The individualized Corona

a wonderful idea in Christmas gifts

THE gift of a Corona will mean more this year than ever before. You can now select a Corona Keyboard which exactly suits the vocation of the one who is to receive it.

There is scarcely anyone who does not need a Corona nowadays. In business, in school, in the home, Corona is fast replacing the pen.

It's a satisfying gift to give, or to receive—wonderfully durable, light, compact, yet big in the work it does.

Corona has a 10-inch carriage, a two-color, automatically reversing ribbon, back spacer, margin release, platen release, paper release, self-spacing carriage return—everything you would expect in a heavy machine—yet it costs only half as much.

Place your order today for one or more Coronas for Christmas. Your dealer will deliver the machines, specially packed in beautiful Christmas cartons, on whatever date you specify. If your phone book doesn't list "Corona," mail the coupon for the address of the nearest store.

CORONA TYPEWRITER CO., INC.
108 MAIN ST., GROTON, N. Y.

Use this list to select your Christmas Corona

If the vocation of the person to whom you will give Corona is not listed here, mail the coupon below.

Classification	*Keyboard Recommended*
Advertising Men	XC-A
Architects	XC-Special
Authors	Standard Portable No. 20
Bankers	" " "
Business Men	" " "
Chemists	XC-Chemical
Children	No. 20
Doctors	Medical No. 19
Druggists	" " "
Engineers	XC-Engineering
Farmers	No. 20
Housewives	" "
Insurance Men	" "
Lawyers	" "
Linguists	XC-Polyglot or any one of 50 languages
Ministers	No. 20
Playwrights	" "
Realtors	" "
Retailers	XC-A
Salesmen	XC-A or Special
Secretaries	No. 20
Scenario Writers	" "
Stenographers	XC-A
Students	No. 20 or Special
Teachers	No. 20 or XC-Polyglot

Note: All "XC" keyboards have 90 characters, with "dead keys" where required.

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108 Main St., Groton, N. Y.

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Address.....

Corona is light and compact, yet it has the toughness and endurance of seasoned hickory. Its record for proved durability goes back over 17 years of continual service.

$50 Ninety-Character Models $5 extra

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Character
$5 extra